NATURE

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University Representation in Parliament.

THE last General Election was held in December 1918 under conditions entirely unfavourable for testing the revised system of university representation introduced by the Representation of the People Act of that year. Many thousands of the graduates of our universities were, figuratively or literally, removing from their minds and their habiliments the accumulated mud of four years' warfare. Women graduates, enfranchised for the first time both for university and for local constituencies, had been too much occupied with the problems, national as well as domestic, arising from the war, to explore the new opportunities of social and political service which the hardly-won privilege of the vote had gained for them. We need not attempt to examine in detail the political conditions which faced the nation at the conclusion of the war. Personalities and powers chose to act in accord with the transient temperament of a dazed and somewhat irresponsible people, a temperament which we now recognise, after four sobering years, was based on unsound economics and impracticable idealism.

If the lessons of the post-war period have been taken to heart, it is our duty in the present General Election to ensure so far as possible the return of members qualified by natural gifts, by training, by experience, to give to parliament expert and disinterested counsel and to press for measures of reconstruction exhibiting sound and lasting principles. It is from this point of view that we propose to discuss the question of university representation. An old and peculiar element in our electoral system, the principle of university representation was, before the war, the subject of acute political controversy. Threatened with extinction, it has survived powerful and persistent attacks and, for reasons to some extent extraneous to the abstract merits of the case, has emerged from the war with enhanced prestige and extended application.

What then is the history and significance of university representation in parliament? Its originator, James I., was friendly-disposed towards the ancient universities of Oxford and Cambridge and indeed to universities in general, for he confessed that if he were not a king he would wish to be a university man. By latters patent under the Great Seal of England he commanded that two grave and learned men professing the civil law should be chosen by each university to serve as members of the House of Commons. In those days parliamentary representatives were usually chosen in pairs, possibly for mutual succour, and the representation of the ancient universities by two members each has remained undisturbed since the beginning of the seventeenth century. Originally the enfranchisement of the universities was regarded as "a great favour to the universities as to the prosecuting their affairs in Parliament." This supposed benefit was soon recognised as to some extent illusory, for whereas under the old dispensation members who had been students of the universities "would stand up as occasion offered on behalf of their respective mothers," this duty was relegated to and, it is said, imperfectly discharged by the elected representatives of the universities. Candidly, we should find it difficult to justify the special representation of universities in the House of Commons if its sole object were deemed to be purely institutional, however important as national institutions our universities may be.

In pre-war days Mr. Asquith's complaint against university representation was that any constituency, whether you call it a university or anything else, will in the long run send to the House of Commons a man whose political opinions are in accord with the predominant opinions of those who sent him; and in support of this contention he was able to quote personal examples, particularly the treatment of Sir John Gorst by the University of Cambridge. This argument is not without weight, but it fails to demonstrate that a group of men and women of similar education and a common loyalty does not form as good a constituency for the election of a member of parliament as a group of men and women who happen to live in a selected locality such as South Kensington or East Ham. As Maitland points out, the ancient idea was the representation of communities, of organised bodies of men which, whether boroughs or counties, constantly met as wholes, and enjoyed common rights and duties. That system has given way as regards local constituencies to the representation of numbers, of unwieldy masses of men and women organised only for the purpose of choosing members. But this opens up a wide constitutional question which cannot be treated, adequately and appropriately, in these columns.

We prefer to base the case for university representation on Lord Balfour's argument—that it is a method of getting into the House of Commons, men of science, men of scholarship, men of special and peculiar gifts quite alien from the ordinary working politician. The fact that university representation provides almost the last survival of plural voting enforces this argument. Representation of special interests in parliament may not be, in the abstract, desirable. Like the weather, it has to be accepted as a mysterious fact; and so long as labour, in a narrow sense, co-operation, "the trade," temperance, and many other interests are able to secure their representatives through the ordinary channels, we shall be well advised to implement the traditional method of securing the representation of science and education and the election to parliament of men and women whose lives have been consecrated, not to the study of the eclectic arts of the politician, but to the pursuit of truth and the advancement of learning. If this thesis be accepted, voters should strive to express in university elections the purpose and ideal which are inherent in this method of election.

Encephalitis Lethargica.

Ministry of Health. Reports on Public Health and Medical Subjects, No. 11: Report on Encephalitis Lethargica. By Allan C. Parsons; with contributions by Dr. A. Salusbury MacNalty and J. R. Perdrau. Pp. x+344. (London: H.M. Stationery Office, 1922.) 10s. net.

THE report on the subject of encephalitis lethargica, recently issued by the Ministry of Health, has a wider than medical interest, as illustrating the still considerable range of disease, of which our knowledge is so partial that preventive action is almost entirely impracticable.

This "new disease" appears to have been first recognised as distinct from other recognised diseases by Von Economico in Vienna in the year 1917. In the early part of 1918 cases were simultaneously reported in Sheffield and London, and prompt action for their investigation was undertaken by the Local Government Board, altogether some 230 cases being recognised during the first six months of that year. The symptoms of this disease, comprising somnolence, from which the patient is roused with difficulty, paralysis of ocular and other muscles, as their most marked features, bore some resemblance to those associated with botulism, and the first task of the earlier investigation was to eliminate the food poisoning to which botulism is due as a cause of the symptoms. This point the earlier official investigations definitely settled. A more difficult question was to decide whether—as was influentially urged—the disease was not a variant of poliomyelitis, which had been recently epidemic, especially among children.

The hypothesis that the two diseases both belonged to what is known as the Heine-Medin group, differing merely in the locality of the nervous lesions, was attractive; but for reasons detailed in the earlier governmental report and confirmed in the present report, this hypothesis, in the opinion of most observers, was satisfactorily eliminated. Similar considerations exclude influenza as a hydra-headed monster, with poliomyelitis and encephalitis lethargica as variants caused by the same virus. In Dr. Parsons' part of the present report the distinctions between these three diseases are judicially stated. Poliomyelitis prevails chiefly in late summer and autumn, encephalitis lethargica in the winter months of December to February inclusive. Poliomyelitis, unlike encephalitis lethargica, attacks chiefly children. Experimentally, the unidentified virus of each disease appears to be a filtrable organism, that of poliomyelitis being readily transmissible to monkeys; that of encephalitis lethargica being transmissible with difficulty and only from acute cases of the disease.

The detailed pathological and bacteriological evidence of the separate identity of these two diseases cannot be given here, but it is set out lucidly in Dr. MacNalty's contribution to the report under review.

The separate identity of influenza is sufficiently indicated by its proverbial infectiousness, whereas multiple cases of either encephalitis lethargica or poliomyelitis are a rarity. Even if it be assumed that the apparent partial non-infectiousness of these two diseases is due to the incarceration of the hypothetical influenzal virus in the deep parts of the central nervous system, it would still need explanation that the virus when introduced in these cases did not cause, *e.g.* in other members of the same family, ordinary attacks of influenza. There is no systematic parallelism in the prevalence of the three diseases; and as Dr. Parsons remarks, "the epidemic behaviour of influenza and encephalitis lethargica do not seem to represent a mutuality of any constant nature." The rarity of respiratory complications in cases of encephalitis lethargica is in itself a strong argument against community of origin.

The present reports by Dr. A. C. Parsons, Dr. A. S. MacNalty, and Dr. J. R. Perdrau, with a prefatory statement by Sir George Newman, bring our knowledge of this disease up-to-date. The value of the report is enhanced by an elaborate bibliography of 1243 items, which will be most useful to students of this obscure subject. The extent of incidence of the disease may be gathered from the statement that in 1919, 541 cases, and in 1920, 890 cases, were recognised and notified, and it is not without significance that cases of poliomyelitis became much fewer in the same period. This may be explained on the supposition that a common virus at different times strikes at different parts of the nervous system; but the totality of evidence, epidemiological, clinical, and pathological, points in another direction.

We began this necessarily sketchy review with a statement that the group of diseases mentioned above do not yet come within the range of practical preventive medicine. When the agitation in one of our chief daily journals in favour of the much-needed Ministry of Health was at its height, the failure of the Local Government Board to control the pandemic of influenza was a big item in the indictment against it. This report, like the recent official report on influenza, should give pause to those who anticipate that uncontrollable diseases will be made controllable by changing the name of a government department. It has to be confessed—and from a scientific point of view it is most important to face the fact—that "respiratory infections" like influenza and (presumably) poliomyelitis and encephalitis lethargica are almost entirely uncontrollable, and will remain so until some new method of securing immunity is discovered, or until a standard of hygienic precautions is reached in respect of coughing, and even of speaking, which is not likely to be attained universally in this century. Even were it attainable, would life then be tolerable?

Meanwhile, every channel of investigation needs to be pursued; and a word of praise may be given in this connexion to the wisdom of making encephalitis lethargica notifiable in 1918 as soon as its separate existence was fairly well established. By this means it has become practicable to investigate each notified case and to demonstrate the general absence of personal infection from recognised cases. By implication we are led to infer that slight unrecognisable cases of the disease exist which cause its spread; but this fact further emphasises the uncontrollable character of the disease in present circumstances.

Encephalitis lethargica has been described above as a "new disease." This merely means that it is a newly recognised disease. Crookshank and others have searched older literature and found descriptions which tally with this disease, occurring commonly in association with epidemics of influenza; and there can be little doubt that the apparent strict modernity of encephalitis lethargica is indeed apparent and not real.

The Telescope.

The Telescope. By Dr. Louis Bell. Pp. ix+287. (London: McGraw-Hill Publishing Co., Ltd., 1922.) 15*s.* net.

INVENTION is not the prerogative of the learned. The telescope, we are told, was the creation of the two little children of an observant father, a spectacle-maker of Holland. But, however casual the origin, its development was the result of laborious and progressive experiment and study, an excellent account of which is given by Dr. Louis Bell in the introductory chapter of the work before us.

There are partisans who will dissent from some of the author's historical statements, and many who will object to the presentation of Newton as a "blunderer," a "bungler," and a man who promptly jumped to a conclusion. As a boy, Newton tested the wind by jumping with and against it, and Sir David Brewster remarks: "This mode of jumping to a conclusion, or reaching it *per saltum*, was not the one which our philosopher afterwards used." Dr. Bell has the same authority for the statement that, when investigating the relationship of dispersion to mean refraction, Newton mixed sugar of lead with the water. Traced to its source, however, this so-called fact appears to be merely a suggestion of Mr. Michell, a friend of Dr. Priestley, offered as an explanation of an otherwise inexplicable experimental result and based on Newton's use of *saccharum saturni* in other experiments.

Flint glass good enough for quantitative observation could scarcely have existed in 1666, for about a hundred and forty years elapsed before Guinand resolved the optical glass problem. It was more the absence of suitable material that "delayed the production of the achromatic telescope by some three-quarters of a century" than any action of Newton. Indeed, Sir Isaac Newton should be honoured for his prescience in recognising that in the circumstances the practice of astronomy could best be advanced by the development of the reflector.

"The Telescope" has been "written for the many observers who use telescopes for study or pleasure and desire more information about their construction and properties," the information hitherto published on the subject being "for the most part scattered through papers in three or four languages and quite inaccessible to the ordinary reader." Within the limits of a single volume the author has collected a great deal of essential information that the general reader will find both useful and interesting.

Following the historical introduction there are chapters on the modern telescope, optical glass and its working, properties of objectives and mirrors, mountings, eyepieces, hand telescopes and binoculars, accessories, the testing and care of telescopes, setting up and housing, seeing and magnification, and finally, a brief appendix on work for the telescope.

The book is not free from mistakes. In the description, for example, of the Galilean glass, the field is stated to be approximately measured by the angle subtended at the centre of the objective by the pupil. The description given in "The Telescope" by Herschel, although theoretically incomplete, might have been copied with advantage, as it explains how the field is determined by the diameter of the objective and the possible displacement of the eye. In chapter 7 the so-called Dove prism system is described as the rudiment of the prism binocular or shortened telescope. Such a system, unlike the earlier Porro combination, cannot be placed in the convergent beam and it cannot serve to shorten the telescope.

Those to whom style and composition are of importance will regret the inelegance of such expressions as "credulous twaddle," "pricked up its ears," and "blast of hot air." Their use detracts from the pleasure of perusal of a welcome addition to the literature of the telescope. JAMES WEIR FRENCH.

An Elementary Work on Coal-Mining.

An Elementary Text-Book of Coal-Mining. By Robert Peel. Revised and enlarged by Prof. Daniel Burns. Twentieth edition. Pp. viii+420. (London and Glasgow: Blackie and Son, Ltd., 1922.) 6*s*. net.

THIS little book is, as its title expresses, a book dealing with the most elementary principles of coal-mining. It has obviously answered its purpose extremely well, and has suited the needs of those to whom it is particularly addressed, as is only too evident from the fact that it has reached its twentieth edition since its original publication twenty-nine years ago. It need scarcely be said, therefore, that the general arrangement and style of the work are beyond criticism, otherwise it would not have survived the rigorous test of experience through which it has passed. Any review of the work must therefore be based upon the nature of the revision to which it has been subjected.

It may fairly be said that the labour of revising such a work falls under three main heads, namely, first to eliminate all possible blunders; secondly, to bring the work thoroughly up-to-date, and thirdly, to see that there is no ambiguity likely to puzzle the student. Unfortunately, it cannot be said that the revision stands the test under any of these three heads, and a couple of illustrative examples of shortcomings may be quoted under each. There are, for example, blunders in spelling, such as "Plainmeller" for "Plenmeller" and "Maudline" for "Maudlin." Under the second heading we have such statements as that the deepest borehole in the world is that at Schladebach, which attained the depth of 956 fathoms. This was true once, but the deepest borehole in the world to-day is that at Czuchow, Rybnik, Upper Silesia, which has attained a depth of 7350 feet. Again, the statement that of centrifugal fans those most generally adopted are the Guibal, Waddle, and Schiele was true once, but is not true to-day. The only reference given to the Kind-Chaudron method of sinking in this country is its first application at Marsden, the far more important, instructive, and recent sinking at Dover not being mentioned. Under the third head we get such a statement as that when it is inconvenient to state work in foot-pounds as the unit of work a higher unit is adopted termed horse-power. The confusion between work and power, to which most students are prone, is one that should never be allowed to creep into a text-book, where the difference between the two standards should be very clearly explained. Again, in dealing with the thickness of tubbing, two formulas are given, one due to Greenwell and the other to Aldis; an example is given of the use of the former, which is here worked out, giving a thickness of 1·19 inches; if the reviser had worked out the same example by the second formula here given, he would have obtained a thickness of 1·98 inches, yet no hint is given to tell the student that the two formulas do not agree, or to help him in any way to reconcile so grave a discrepancy.

It is also a pity that so many of the illustrations are mere sketches, and badly executed at that. As an example Fig. 104, which is intended to be the plan of a horizontal winding engine, may be quoted; an intelligent boy of twelve who had seen a winding engine would probably in his drawing indicate that there are such things as valves and valve-rods.

It has been thought advisable to direct attention to the points in which this little book falls short of the standard to which it might so easily be raised, because, as already stated, it has evidently a very decided sphere of usefulness, and in a work of this kind addressed to the beginner it is pre-eminently necessary that he shall receive no wrong impressions and shall be left with nothing to unlearn when he advances to the higher stages of the subject.

Essays on French Science.

Discours et mélanges. Par Émile Picard. Pp. v+292. (Paris: Gauthier-Villars, 1922.) 10 francs.

THIS volume contains discourses, short essays, and obituary notices of some distinguished French men of science. It may be warmly recommended, more especially on account of the obituary notices, which do not confine themselves—as is too frequently the case—with an account of the work done, but tell us something of early surroundings, education, and temperament, and thus bring out the personality as well as the results achieved. It is not only that the account gains in interest thereby, but the information allows us to judge more adequately of the individual influence exerted on contemporary science.

Pierre Duhem's work is recognised in this country by every one familiar with thermodynamics, but the personal touches which M. Picard's account supplies give us just what is wanted to appreciate the full value of the man. Poincaré is better known to us, perhaps Darboux also, but we shall find here something new about them as well as about others with whose work M. Picard deals. The notice of Lord Kelvin is excellent.

The author does not always confine himself to those branches of science which he has himself enriched by valuable contributions. As secretary of the Academy of Sciences he has to undertake the duty of explaining the ground for the award of prizes, some of which, like that founded by Mr. Osiris, include a wide range of subjects. We thus find short discourses on "French Aviation in 1909," and even on "Antityphoid Vaccination." A lecture on the diminution in the birth-rate was no doubt inspired by the atmosphere of the war, and some of the other writings are even a more direct outcome of the anxieties of the time at which they were written. Here it is perhaps allowable to make one criticism. In the essay on "Les Sciences mathématiques en France," M. Picard shows so much knowledge of scientific history in other countries and such fair appreciation of the international aspect of science, that one regrets the inclusion of an article that originally appeared in the *Revue des Deux Mondes*: "L'histoire des sciences et les prétentions de la science allemande." There is no doubt much in it that is true, but it is not written in the dispassionate and eminently fair spirit which pervades the rest of the book and it strikes a discordant note.

Graphical Methods in Crystallography.

Graphical and Tabular Methods in Crystallography as the Foundation of a New System of Practice: With a Multiple Tangent Table and a 5-Figure Table of Natural Cotangents. By T. V. Barker. Pp. xvi+152. (London: T. Murby and Co., 1922.) 14*s.* net.

IT has been anticipated for some time that Mr. Barker would publish an account of the graphical and tabular methods in crystallography which he has been teaching at Oxford, and that his book would include a description of the form of two-circle goniometry and its special application to crystallochemical analysis, which he recommends as the result of his studies in Russia under the late Prof. Fedorov. The present volume only very partially fulfils these expectations, crystallochemical analysis being reserved for a further publication. So far as it goes, however, the book is a valuable presentation of extant graphical methods, and it concludes with a most useful table of multiple tangents.

The main purposes of the monograph are "to provide the researcher with a select collection of exact graphical methods, which personal experience has proved to be both accurate and time-saving; to discuss the relation of these methods to formal processes of computation; and, finally, to outline a new system of practice." The methods described involve the use of both the stereographic and gnomonic projections, and are a mixture of the well-known ones due to Penfield, Hutchinson, V. Goldschmidt, and Fedorov. A crystallographic protractor is described and recommended, which in itself is a happy combination of the features of the Penfield, Fedorov, and Hutchinson protractors.

The new system of practice, which forms the subject of the last chapter, is obviously chiefly concerned with rapid (time-saving) work, with a view to the inclusion of some crystallographical account of all new substances, as well as existing ones, in a comprehensive catalogue, or to the identification of a crystallised substance by the comparison of such rapidly acquired data with that contained in such a compendium of measured substances. Two-circle methods are used, and the table of angles characteristic of a substance consists of the theodolitic ϕ azimuth and ρ altitude values. It is suggested that "two, or at most three, crystals be measured," that "the indices be determined by a time-saving method," that "the mean observed angles be published without any citation of limits," and that "the practice of computing theoretical angular values (apart from those involved in the elements) be discontinued." This may satisfy Mr. Barker, and may possibly be adequate for the particular purpose which he has in view. But it is most sincerely to be hoped that serious crystallographic research is not to be so circumscribed, and that absolute accuracy will be placed before time-saving. Otherwise we shall rapidly revert to former chaos. It has been, indeed, only by the most accurate and laborious work, in which time was regarded as subservient to the highest accuracy, that the subject has been brought to its present high position; this alone has rendered possible the wonderful confirmation, by the absolute measurements now made by the Bragg X-ray spectrometric method, of the work of the later crystallographers.

Our Bookshelf.

Magnetism and Electricity. By J. Paley Yorke. New edition, completely rewritten. Pp. viii + 248. (London: E. Arnold and Co., 1922.) 5*s.* net.

WRITTEN in colloquial language, this book, which is a first-year course on magnetism and electricity, will appeal to many beginners besides the students in technical institutions, for whom it is primarily intended. "These students have one great quality: they are out to learn and to understand, and as they are not hampered by the immediate necessity of cramming for any particular examination, are able to enjoy the pleasures of understanding instead of suffering the terrors of memorising. . . . Memory is useful for examinees, but understanding is essential for engineers." There is abundant evidence throughout these pages that the author is familiar with the difficulties met with by the beginner, and he is always careful to explain the technical terms which are apt to be used freely by text-book writers who have almost forgotten that their jargon is not that of the man in the street. Magnetism is first dealt with, and then the ideas of static and current electricity are introduced. The author is particularly successful in developing the self-contained water circuit analogy, the basic idea of which is that energy can be distributed without any consumption of the water. Experience has convinced him that the plan of introducing the measurement of electrical energy at an early stage is very effective. The basic ideas of electro-magnetic induction are discussed in some detail, and in the final chapters the phenomena of electrostatics are briefly treated. We can recommend the book to those for whom it is intended, but fear to think what the modern relativist would have to say to such statements as, "Anything which has weight is called *Matter*: magnetism is therefore not matter" (page 21); "This something which is called energy has not got weight" (page 57)!

The Climates of the Continents. By W. G. Kendrew. Pp. xvi + 387. (Oxford: Clarendon Press, 1922.) 21*s.* net.

MR. KENDREW strikes new ground by giving a description of the actual climates of the regions of the world. The scope of the treatment must naturally vary with the nature of the original sources which are available, but no detailed local descriptions are attempted. A general knowledge of meteorology is assumed. There is no explanation of the omission of polar climates, north and south. Quite enough is now known of these climates to enable useful accounts to be included in a book of this sort. The oversight mars the usefulness of the volume. We notice that Mr. Kendrew adheres to the idea that the heating of north-west India furnishes an explanation of the south-west monsoon. The comparatively poor rainfall in the north-west he attributes to the previous course of the winds reaching that region, which has deprived them of much of their moisture. According to Dr. G. C. Simpson, the explanation is far more complex, and depends on several factors, of which one of importance is the dry upper-air current from the west, which prevents cloud formation in the ascending air. These and other recent theories regarding the monsoon are not discussed by Mr. Kendrew. There are many clear diagrams and maps, and numerous meteorological data. All students of geography will be grateful for this well-arranged and lucidly written volume.

Miracles and the New Psychology: A Study in the Healing Miracles of the New Testament. By E. R. Micklem. Pp. 143. (London: Oxford University Press, 1922.) 7*s.* 6*d.* net.

THIS work is concerned with a comparison between the healing miracles described in the New Testament and the case records of modern psychotherapy chiefly drawn from war practice. A brief description of modern psychotherapeutic measures is given, but the complexity and difficulty of the subject almost necessarily makes such a sketch confusing to the uninitiated reader. The sources of the New Testament narratives are examined and the inexactitude of observation is commented upon, especially in the fourth gospel. The current superstitions anent the relationship of sin and disease and demonology are noticed as likely to colour and detract still further from the trustworthiness of the descriptions.

The miracles are then dealt with *seriatim*, and where possible, recent parallel cases are quoted. Finally, the author disclaims the belief that all the subjects of the healing miracles were suffering from what would now be called functional disease, but seeks to support his thesis that these works of Christ were in accordance with natural laws, by quoting cases (not always convincing) of the effect of psychotherapy on organic disease.

The general impression of the book is that while the author has made out a plausible and even probable argument that the miracles were not supernatural phenomena, his parallels are not sufficiently exact to carry absolute conviction. Such exactitude could never be obtained in view of the unscientific observations of the New Testament cases by men who certainly thought these works were supernatural and were quite untrained in medical knowledge. As the author points out, even Luke "the physician" uses terms rather less exact from the medical point of view than do the others. The book is certainly readable and interesting, but belief that the ministrations referred to in it were miraculous is not likely to be disturbed by the author's scientific consideration of the evidence upon which it is based.

A Book about Sweden. Pp. 183. (Stockholm: A.-B. Nordiska Bokhandeln, 1922.) n.p.

WE have received through the Swedish Consulate-general in London a copy of "A Book about Sweden," published in Stockholm by the Swedish Traffic Association. It is a compact guide, very fully illustrated, written in English for those who may wish to visit Sweden, or for those who have not yet realised what a charming and novel field awaits the tourist, accustomed to think of Europe as centred in Grindelwald or Assisi. The photograph of the s.s. *Saga*, now running between London and Gothenburg (Göteborg), invites the Englishman by a reminder of his Viking blood. The description of the country and its human occupations is geographical, and many of the views, such as those in Lappland, are difficult to obtain from other sources. That of the iron-mountain of Kiruna, lit up electrically for work in the long winter night, illustrates one of the great romances of Swedish industry. The account of power-developments in general will interest scientific readers. We are shown the fascination of Abisko, remote within the Arctic Circle; but nothing is said about the summer mosquitoes, and the happy tourists at Torneträsk seem to be going about unveiled. The manifold charm of Stockholm, a city unlike any city, the sweet clean beauty of the forest country, the rush of waters at Porjus and Trollhättan, are here simply set before us. If one knows Sweden already, it is all the more delightful to turn these pages, and, as the Dalarna poem says, to long for her again. This little handbook may be recommended to British teachers of geography. G. A. J. C.

14,000 Miles through the Air. By Sir Ross Smith. Pp. xii+136. (London: Macmillan and Co., Ltd., 1922.) 10*s.* 6*d.* net.

THIS small volume by the late Sir Ross Smith marks an epoch in the history of flying, for it is a record of the first flight from London to Australia. Sir Ross Smith and his brother, Sir Keith Smith, accompanied by two air-mechanics, Sergeants J. M. Bennett and W. H. Shiers, entered a Vickers-Vimy aeroplane for the prize of 10,000*l.* offered by the Commonwealth Government in 1919 for a flight from England to Australia in 30 days. As is well known, the two brothers won the race. They left Hounslow on November 12, 1919, and reached Darwin on December 10, 1919. From there the flight was continued to Sydney, Melbourne, and Adelaide. The actual time spent in flying between London and Adelaide was 188 hours 20 minutes. The longest spells in the air were 730 miles from Bundar Abbas to Karachi, and 720 miles from Karachi to Delhi. The brevity of the book makes it all the more vivid, and helps the reader to realise the speed of travelling by air. The author gives few incidents and certainly dwells lightly on the difficulties encountered. But there are some exciting passages, of which one of the best is the flight through the clouds between Rangoon and Bangkok, and the groping descent with the fear of collision with the heights of the Tenasserim Ranges. The book is well illustrated, the pictures of cities taken from the air being very striking. It is much to be regretted that this high-spirited airman lost his life at the very start of his next great adventure, a few years later, of the flight round the world.

Evolutionary Naturalism. By Prof. R. W. Sellars. Pp. xiv+349. (Chicago and London: The Open Court Publishing Co., 1922.) n.p.

THE author of this book is one of the "critical" realists. The difference between a neo-realist and a critical realist would seem to be that the former regards the datum of perception as identical with the object of knowledge, while the latter distinguishes between them. The neo-realist says that we know the physical existence in perceiving it, the critical realist says we know the existence of the physical thing but what we perceive is its essence. Objects exist, but only their content and not their existence is perceived. The special theory which Prof. Sellars names evolutionary naturalism is based on this distinction. Its two great enemies, we are told, are Platonism and Kantianism, both of which are supernaturalistic. The theory is worked out in laborious detail and applied to the different problems of philosophy.

Greek Biology and Greek Medicine. By Dr. Charles Singer. (Chapters in the History of Science, I.) Pp. 128. (Oxford: Clarendon Press, 1922.) 2*s.* 6*d.* net.

DR. SINGER here gives a succinct account of the general evolution of Greek biological and medical knowledge. The biological portion of the book is arranged in three sections, "Before Aristotle" (18 pp.), "Aristotle" (36 pp.), and "After Aristotle" (24 pp.); the remaining 50 pp. being allotted to Greek medicine. The section on Aristotle appears here for the first time; the others are reprinted, with slight amendments, from "The Legacy of Greece." All who are interested in the biological sciences will be glad to have in this cheap and convenient little volume an authoritative account of the works of Aristotle, Galen, Hippocrates, and others who laid the foundations of the science of life; and the majority of readers will be amazed at the extent of our indebtedness to Greece.

Letters to the Editor.

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The Structure of the Red Lithium Line.

IN a recent number of the Proceedings of the Royal Society Prof. McLennan and Mr. Ainslie have announced the interesting discovery of a new component of the line $\lambda = 6708$ in the spectrum of lithium, the line appearing, under the conditions of excitation employed by them, as a quartet. They proceed to discuss the possibility of this structure being due to two pairs of lines, each pair being assigned to one of the isotopes of lithium. To the present writer it appears that the new components cannot be accounted for in this manner.

The structure of the line in question has been investigated by Kent (*Astrophys. Journ.* vol. 40, p. 337, 1914), Takamine and Yamada (Proc. Tokio Math. Phys. Soc., vol. 7, No. 18, p. 339, 1914), Zeeman (Proc. Roy. Acad. Amsterdam, p. 1130, Feb. 1913; p. 155, Sept. 1913), King (*Astrophys. Journ.*, vol. 44, p. 169, 1916), and the writer (Proc. Roy. Soc. A, vol. 99, p. 101, 1921). Kent, and Takamine and Yamada, observed it as a single pair of emission lines, and Zeeman, who investigated the absorption spectrum, also recorded a single pair of lines, with the reservation that with a high density of the absorbing vapour other lines made their appearance. Zeeman considered that these lines which appeared at high vapour densities were analogous to lines observed in the sodium spectrum by R. W. Wood. King, who investigated the structure of the line in the arc and in the tube-furnace, found that with a low vapour density the line appeared as a simple pair, and that at higher vapour densities a third component appeared; with a still greater amount of vapour the phenomena were complicated by reversal. King has published one photograph in which, owing to reversal, the line has the appearance of a quartet. McLennan and Ainslie used a vacuum arc under conditions in which it would appear that the density of the lithium vapour must have been very great, and one may surmise that this condition is essential for the appearance of the fourth component.

It seems, however, that under appropriate conditions the line appears as a simple pair, and our ideas as to the nature of isotopes would have to be profoundly modified if the pairs due to the two isotopes were found to require different conditions for their excitation. If the four components were really two pairs due to the two isotopes they should always appear together with an invariable intensity ratio of 1 : 16. The line can be seen easily as a simple pair in a carbon arc in air if the poles are brushed over with an exceedingly dilute solution of a lithium salt. The components are then less sharp than when the vacuum arc is used, and the main difficulty is to have little enough lithium in the arc, so as to avoid the appearance of the third component and complex structures due to reversal. In the vacuum arc the third component appears very readily unless the amount of lithium vapour is small. It may further be mentioned that the relative intensities of the components are not in good accordance with the view that they are due to the two isotopes.

From a theoretical point of view also, there are grave difficulties. The calculated separation, on Bohr's theory, of corresponding lines in the pair, is about 0·087Å., the observed separation being between three and four times as great. McLennan and Ainslie put forward the suggestion that the separation may in fact be the product of the "calculated separation" and the atomic number; but the correctness of the calculated separation has been verified by the observed differences between the lines of the Balmer series of hydrogen and alternate members of the ζ Puppis series of helium, and in this case the agreement is exact and the "calculated separation" does not require to be multiplied by a factor of 2, the atomic number of helium. T. R. MERTON.

The Clarendon Laboratory, Oxford,
October 19.

The Mechanism of the Cochlea.

IN view of the discussion in these columns towards the end of 1918, and the letters which followed it at various times, the model designed by Mr. George Wilkinson, of Sheffield, and described in NATURE of October 21, p. 559, is of much interest and importance. It is obvious that the construction of such a model presented many mechanical difficulties, and great credit is due to Mr. C. E. Stewart, the mechanician of Prof. Leathes's laboratory, for the successful result. It may, therefore, be useful to mention that a full description was published in the *Journal of Laryngology and Otology*, of September last, a short account having been given in the Proceedings of the Physiological Society (*Journal of Physiology*, vol. 56, p. ii). The apparatus was demonstrated to the Physiological Society in December 1921, as also to the British Association in September 1922.

I take it that others besides medical students have been dissatisfied with most of the theories put forward to avoid the difficulties thought to be involved in the Helmholtz view of the resonance of the basilar membrane. Those theories in which this membrane is supposed to act as a whole, like a telephone diaphragm, or by "pressure patterns," are inconsistent with the progressive differentiation of structure along the membrane, in addition to being in conflict with what is known of the conducting properties of nerve fibres. Thus the views suggested by Ewald, Rutherford, Waller, and Wrightson are unacceptable. It appears that although Helmholtz had referred incidentally to "loading" of the vibrating elements of the membrane by the liquid in which it lies, the great importance of this factor was first realised by Mr. Wilkinson and investigated experimentally by him. His model is doubtless capable of still further improvement, but even in its present form many problems would have light thrown upon them by its behaviour. The degree of damping and the spread of resonance to neighbouring elements may be mentioned. The number of waves required to excite sympathetic resonance of a tuned element may perhaps be determined. Some degree of spread is not inconsistent with the Helmholtz theory, since the amplitude of vibration of other elements than those in tune with the vibrations received might well be too small to stimulate the nerve endings. Dr. Gray has shown that a similar cutting out of small stimuli takes place in the localisation of a point of pressure in the skin.

It is of interest to note that the model responds to a tuning-fork held in contact with the brass case, just as the cochlea does to conduction through bone. This indicates that the impulses given by the movements of the stapes are the same as those of sound waves directly transmitted through water, as would be expected from theoretical considerations.

Mr. Wilkinson also points out in his paper the necessity for the basilar membrane being continuous. If the fibres had gaps between them, no regular loading of the vibrating elements would be possible.

W. M. BAYLISS.

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THE description of Dr. Wilkinson's model of the cochlea in NATURE (October 21, p. 559) recalls Dr. Yoshii's experiments on guinea-pigs. Yoshii operated with long-sustained notes from whistles of different pitches, and concluded from the resulting lesions in the organ of Corti that the pitch of the note determines the region of maximal displacement of the basilar membrane. But as he used the same pressure to blow the different whistles (*Zeitschr. f. Ohrenheilkunde*, 58, 1909, p. 205), the product a^2n^2 had a constant value, *i.e.* the greater the frequency of the note employed, the less the amplitude of its vibrations, which shows at once that Yoshii's results do not support his conclusions. If Dr. Wilkinson's model of the cochlea is a good one, it will show that the locus of maximal vibration in the basilar membrane for a given note shifts toward the distal end when the intensity of that note is increased, and toward the fenestral end when its intensity is diminished; and will thus demonstrate once again that the principle of resonance can find no application in the internal ear.

W. PERRETT.

University of London, University College, Gower Street, W.C.1, October 26.

An Empire Patent.

IN the article appearing in NATURE for September 30, p. 437, with the above heading, there is the underlying assumption that the status of the inventor should be assimilated to that of the author, namely, that both should be secured a world-wide monopoly at a minimum expenditure. Will you allow me to present in your columns a more philosophical view of the history and function of patent law in relation to the growth and decay of civilisation, from which it will be seen that the favourable treatment of the inventor cannot be based upon international principles. It is part and parcel of a purely national and competitive policy.

The processes by which the characteristics of a higher civilisation are transmitted to races of lower culture appear to be based ultimately upon biological laws. Pressure generated within the walls of the higher civilisation drives out its more enterprising citizens to seek their fortunes elsewhere, and the new colonists, by interbreeding with the native stock, impart to it their own superior characteristics. The outward forces tending to the disruption of the older organisation may be economic, religious, or political, or some combination of these. The process may occupy centuries or be accomplished within as many decades. Thus the industrialisation of the English occupied many centuries—the periods of advance in the reigns of Edward III., Elizabeth, and Charles II. being associated with large influxes of the industrial population of the Continent. On the other hand, the rapid rise of the United States to the rank of a first-class power has been the work of the past fifty years. In both these instances national development was preceded by conditions which favoured the introduction and assimilation of a higher strain from abroad. Maintaining a civilisation at a high level in turn rests upon its compliance with the same biological law.

Talent and enterprise are the natural monopoly of a relatively small fraction of the human race. These characteristics are transmitted by direct descent, reproducing themselves in successive generations. How closely the fortunes of an industry may be associated with particular family names—notwithstanding the dilution which each family undergoes by marriage—is not sufficiently recognised. It has, for example, been shown recently that iron founding was introduced into this country by a body of French workers in the reign of Henry VII. A leading family which came in at this period were the Leonards, members of which migrated to the United States in the seventeenth century; whence the saying arose, that "where you find ironworks there you find a Leonard." But there is some reason to suppose that the French iron-founders originally came from Italy. Hence the Leonardos, Lennards, or Leonards may trace their connexion with this industry perhaps for 500 years. This reappearance of the same characteristics in successive generations of a family, and the predominance of the imported families in the higher ranks of culture—other than that of administration—can be verified by reference to the National Directories. A Stirling is generally an engineer, a Hochstetter a mineralogist, a Matthiessen a physicist. These families form a cosmopolitan body whose services can be enlisted by any country which possesses the power and foresight to attract them. Thus the maintenance of a civilisation depends upon its power to retain the services of its best native stock, while constantly reinforcing it from outside sources.

At an early period in the history of this country, bringing in companies of skilled artisans from abroad became an accepted feature in the exercise of the Royal prerogative. In the reign of Elizabeth a new feature was introduced, whereby, in addition to the Royal protection and favour, an exclusive right of manufacture was granted to any institutor of a manufacture not in use within the realm at the date of the Letters Patent. This system, though opposed to the tenets of the Common Law, received a grudging recognition in the Statute of Monopolies in 1624. Under this Statute the rights of the native inventor rested on the fact of his profession that he was willing and able to institute a new industry. The efficacy of the law rested upon two principles: that it attracted foreign strains of inventive ability, while stimulating that of the native inventor. Anthropologists are agreed that there is a fairly equal distribution of ability in different races. The English Crown recognised the deficiency in native stock and made good its defects by selective racial interbreeding.

The first blow to the efficiency of the English patent system was struck in the last quarter of the eighteenth century by a judge of the King's Bench. It is well known that there is a remarkable hiatus in the continuity of patent law decisions for the century and a half subsequent to the Statute of Monopolies. The reason for this is now clear. The Crown, notwithstanding the provisions of the above Statute, successfully maintained the right of disposing of its own grants by constituting the Privy Council the Court before which alone the validity of patent rights could be adjudicated. In spite of the more than doubtful character of its jurisdiction, the Council proved a most competent and business-like tribunal. It never lost sight of the real object of the law. Hence proposals for instituting new industries were not allowed to drop if a suitable applicant for the privilege was forthcoming. The rights of the native workman were carefully respected. Occasionally technical points of law were reserved to the Common Law Courts, and in exceptional cases parties were allowed to seek their legal remedy; but in only one doubtful case during this period has any decision of the Courts found its way into patent jurisprudence.

With the Hanoverian dynasty the zeal of the Council in prosecuting its industrial policy sensibly abated, and about 1750, after an unseemly squabble between Lord Mansfield and the Privy Council, the jurisdiction of the Council was allowed to lapse. Thus when the Common Law Courts resumed their jurisdiction over Letters Patent they were without precedent to guide them for a period of about a century and a half.

It was in these circumstances that the well-known doctrine of the patent specification was evolved. Interpreting the Statute of Monopolies by the contemporary meaning of its language, the Courts construed the phrase "true and first inventor" in its modern sense. This left the Statute devoid of any expressed consideration; for it invested the inventor with rights without any corresponding obligation. True there was a clause in the Letters Patent of recent introduction which made the validity of a patent contingent upon the filing of a specification within a fixed period, but there was also an older final clause waiving a full, or indeed any, disclosure. By emphasising the former and ignoring the latter clause, Lord Mansfield laid down that the patent grant was made in consideration of the filing by the patentee of such a description of his invention as would enable a skilled artisan in the trade to work the invention. The effect of this judgment was to make the validity of patents conditional upon their compliance with an uneconomic and, from an administrative point of view, impracticable standard of novelty; for the decision involved the shifting of novelty from the practice of the trade to novelty of disclosure within the realm. By depreciating the security of the patent it lowered its commercial value —while discouraging the importation of industries not practised within the realm. As, however, no attempt was made to bring administrative practice into harmony with the legal requirements, applicants continued to obtain their patents on the old basis.

In 1905 a fifty years' search through British patent specifications came into operation. It was instituted as an instalment of a wider scheme of examination to be introduced at a future date. The effect of official examination is always to reduce the restraining power of a monopoly in a degree corresponding with the extent of the search. A representative of one of the largest patent-owning firms in the United States once said to the present writer, "Our American patents are not worth a d—n! We take them out because they are cheap!" Without applying this dictum wholesale as a criterion of the value of the patents issued by any office which examines for novelty, it is clear that the effect of official examination is to reduce a large proportion of its grants to the level of commercial advertisement. If it be alleged that the object of the above measure was to harmonise the law and practice of patents, it must be pointed out that the framers of this Act introduced at the last moment a clause to "round off" the official search by removing British patent specifications not retained on or included in the official files from the stock of public knowledge. Thus the Common Law standard was sacrificed to official convenience. In this manner the English Law of Novelty has been made to box the compass. Valid patents can now be obtained without any consideration, for the disclosure may be identical with that already disclosed and published. The latter cannot be cited as evidence of prior anticipation. Let it be granted that no public inconvenience has arisen under the operation of this clause: but this admission undercuts the whole case for official examination so far as that examination is conducted through specifications of lapsed patents. The law obviously stands in need of a clear and business-like statement of its principles. An attempt in this direction was made in the Patents Act of 1919, which explicitly reaffirms the doctrine of the old Law as to "working"; but as no concurrent relief was provided for the patentee on proof of commercial working, the value of the British patent continued on its downward path.

One step only remains to be taken to deprive our patent law of its last vestige of biological significance, namely, the abolition of protection to the importer of a new industry. This change, however, is foreshadowed in the Report of the British Empire Conference of 1922, the delegates to which suggest that this principle should be sacrificed on the altar of imperial uniformity.

Is this country so far ahead of others in its industrial lead that it can afford to discard from its armoury the competitive principle which formed the basis of its early practice, securing for it that lead which it is frittering away to-day? The period of industrial progress, which dates from 1770, was marked by a continuous and fairly parallel growth in population and patent statistics which culminated in the year 1910. In 1911–12–13 the patent statistics began to fall away, and in the same year, 1911, the rate of growth of population showed a flattening tendency which has persisted to this day. These unfavourable symptoms are not equally reflected in the corresponding statistics of other countries.

Hence a case appears to be established for an inquiry into the working of a system which, as the result of successive modifications during the last fifty years, has lost all claim to industrial value, consistency, or administrative economy. In this inquiry all considerations of international or imperial comity should be subordinated to the national interest. The services of the inventor should be competed for by offering him the widest security for his monopoly compatible with the state of the national industry. On proof of commercial working, the validity of his patent should be freed from attack by proof of prior publication within the realm, and the patent freed from the payment of further renewal fees. On these lines the law and practice could be made consistent, effective, and economical. The cost of administration would be materially reduced, delays would be avoided, and a broad claim to the invention made secure so soon as the full consideration of the patent was given by its reduction to practice. There would, no doubt, be some increase in litigation, but patent litigation is a sign of healthy progress. These are matters clearly within the control of human agency, but courage and conviction are needed to bring about the reforms. When a vacancy occurs in a university readership the stipend is fixed at a figure calculated, as Lord Bacon says, "to whistle for the ablest men out of all foreign parts." Educationists do not accept the latest thesis as a substitute for personal service. In the same way, new teachers in industry should be requisitioned to keep our manufactures abreast of foreign enterprise. A nation which aspires to maintain its place in the hierarchy of power must conform to the teaching of natural laws.

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Transcription of Russian Names.

I DO not wish to prolong the correspondence upon this subject further than to say that in their letter appearing in NATURE, October 14, p. 512, Messrs. Druce and Glazunov meet (in my opinion) none of the objections to a Czech-script transliteration of Russian pointed out in my letter (NATURE, July 15, p. 78), but merely reiterate their views,—in which, by the way, I think I could pick a number of holes were space available.

But I should prefer not being misquoted.

I did not "ask how many English people can correctly pronounce Czech letters like *č*": (for, of course, any one can pronounce that letter, *i.e.* English *ch*). I said I wondered "how many Britons would pronounce this 'c' [that is, *ts*] correctly"—if they came across it suddenly in a Czech-script transliteration of Russian. The same criticism applies to the quoted Russian х (=Czech *ch*), which would, therefore, be wrongly pronounced by the ordinary Briton as *ch* in church instead of as *ch* in loch.

As I previously pointed out, the very simple Royal Geographical Society II. system already exists in English; so why not use it? EDWARD GLEICHEN.

Royal Geographical Society, Kensington Gore, London, S.W.7, October 20.

APART from the typographical objections to a Czech transcription of Russian, which have been pointed out by Lord Edward Gleichen, there are other difficulties in its use. From Prof. Brauner's examples his does not appear to be a uniform letter-for-letter system, at all events in the treatment of Russian "soft" vowels. For example, the letter я, when initial, would presumably be transcribed *ja*, as in языкъ, *jazyk*; but if it happens to follow д, н or т, the letter *j* is dropped in the transcription and the Czech letters *ď*, *ň*, *ť*, are employed, *vide* Prof. Brauner's examples *Ťaťana*, *Ďada*. And how is Russian "soft" р, which is represented in the Czech language by *ř*, pronounced *rzh* (*r* + French *j*), to be transcribed? For example, is рядъ to be rendered *řád*, which gives the wrong pronunciation, or *rjad*, which is not Czech?

Again, it is not clear how Russian е and ѣ are to be treated. The natural Czech transcription would be *e* and *ě* respectively; but Prof. Brauner writes *Menděléjev*, in which there are three different ways of transcribing Russian е.

The semivowel й is apparently to be transcribed *j*; but *ij*, *yj*, are not the Czech equivalents of ій, ый. Does Prof. Brauner write *Čajkovskij*? (Incidentally, the average Briton would pronounce *čaj* like *cadge*.)

Prof. Brauner would, I hope, go so far as to abandon Czech for the transcription of Russian г, and would let us write *Vinogradov*, though the true Czech would be *Vinohradov*.

Messrs. Druce and Glazunov maintain (NATURE, October 14, p. 512) that the system has the advantage of being complete; but what is the complete system? The foregoing points want clearing up.

JOHN H. REYNOLDS.

Royal Geographical Society, Kensington Gore, London, S.W.7, October 21.

Volcanic Shower in the N. Atlantic.

THROUGH the courtesy of Dr. Russell (Director) and of Mr. J. W. Carruthers, of the Fisheries Laboratory of the Ministry of Agriculture and Fisheries at Lowestoft, I am enabled to record a shower of volcanic dust that occurred near the Faroes on Thursday, October 5, soon after 5 A.M.

The captain of the steam trawler *Prince Palatine* reports that his mate directed his attention to what looked like a sudden appearance of land on the port quarter, when the vessel was about 62° 7′ N. and 7° 43′ W., Myggenæs (an islet west of Vagö) being on the starboard quarter. A heavy sandstorm soon enveloped the vessel, lasting for the extraordinary period of sixty-seven hours, during which the air resembled that of a London fog, while the vessel was covered with a deposit from stem to stern. Only a very small sample of the material is available; but Mr. Carruthers rightly concluded that it consisted of volcanic glass. With him, I note a few opaque particles; but these are in part white by reflected light, while others are merely fragments of deeply coloured glass. The material is a characteristic dust of volcanic glass, distinctly brown, and probably andesitic or basaltic. I can trace no crystals; some of the particles show twisted wisp-like forms, and the majority are comminuted pumice, resulting from attrition in the air of masses in which the volume of vesicles exceeded that of glass. Branching forms, like spicules of lithistid sponges, are thus common. Mr. Carruthers informs me that the Meteorological Office record shows that the position of the fall lay in a cyclonic depression, with a wind from somewhat east of south, blowing at 17 miles an hour.

The duration of the fall may possibly be due to a circling round of some of the material. Its occurrence seems worth recording, for comparison with dust that may have fallen on other ships at the same date. Some account may be forthcoming from the northern isles of the Faroe group. It is most probable that the source was an eruption in Iceland, the dust having in that case travelled about 500 miles. The fine glassy dust has no doubt become sifted out from coarser matter during transit.

GRENVILLE A. J. COLE.

Carrickmines, Co. Dublin, October 21.

Orientation of Molecules in a Magnetic Field.

ABOUT this time last year, at the suggestion of Prof. A. W. Stewart, I began some work to test whether or not the molecules of a substance (more particularly at first of a liquid) underwent an orientation when placed in a magnetic field. So far the results all seem to indicate that something of the kind does take place. The method first adopted was analogous to Laue's method of diffracting X-rays. A parallel pencil of X-rays was directed through a small cell containing barium iodide placed between the poles of a large electro-magnet, and was then received on a photographic plate. During the first complete exposure no current was run through, during the next current was run through, and the process was repeated with a second pair of plates. In the case of both pairs of plates it was found that the disc which came up dark on development was greater in diameter for the exposure during which the magnet had been excited than for that when it had not been excited. The increase was more than ten per cent. of the original diameter. This effect may be analogous to that observed when a pencil of X-rays is passed through a powdered crystal. So far this method has not been used in a very refined manner, but it is hoped to continue with it and to improve it. The results obtained by it, however, have been corroborated by entirely independent methods, in which the properties of X-rays were not made use of.

The question of the nature of the orientation, in addition to that of its occurrence, is still under investigation here, and I hope to be able shortly to make a further communication on this subject, giving more detail as to both the results obtained and the methods employed. MARSHALL HOLMES.

The Sir Donald Currie Laboratories, Queen's University, Belfast, October 10.

The Ramsay Memorial in Westminster Abbey.

IT is a somewhat inhuman trait among British men of science, and in particular among chemists, that they have not sufficiently secured public honour for their fathers who spiritually begat them. Boyle's resting-place is unknown, and there is no express memorial to him in the Royal Society, of which he was the greatest founder; and to the chief of his chemical successors, however well remembered in the records of their science, tangible monuments for the most part exist only where purely local pride has preserved or erected them. The ceremony of November 3, therefore, when a medallion tablet in memory of Sir William Ramsay was unveiled in Westminster Abbey, was a most welcome manifestation of a world-wide tribute.

The British nation at large was represented in the person of H.R.H. the Duke of York (the Prince of Wales being prevented by a riding mishap); Sir Charles Sherrington, president of the Royal Society, stood for British science, together with a large gathering which included many of its foremost followers; Prof. Le Chatelier came from Paris as president of the Academy of Sciences; while the presence of the ambassadors and ministers of no fewer than twenty-one countries attested the far-reaching fame of Ramsay's achievements. Lady Ramsay was present, with Mr. W. G. Ramsay, and Dr. and Mrs. H. L. Tidy and their children. A short choral service was held in the nave, during which the Duke of York unveiled the tablet and offered it to the Dean, who in dedicating it referred to the panels commemorative of Joule, Kelvin, Hooker, Darwin, and Lister, among which it is to be permanently set. The medallion was provided from the Ramsay Memorial Fund.

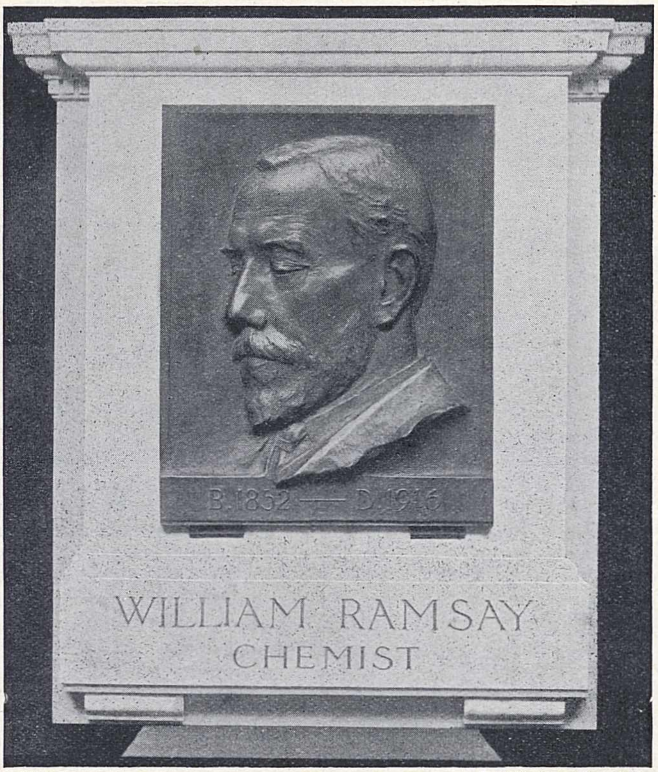

Photo.] [*Elliott and Fry, Ltd.*

FIG. 1.—The Ramsay Memorial, Westminster Abbey.

This fund, begun in 1917, consists of nearly 58,000*l*. raised by private subscription all over the world; and the capitalised value of the additional endowments by Dominion and foreign governments is as much again. Eleven Ramsay Fellowships, each of annual value at least 300*l*., enable promising research-students to come to carry on work in any selected chemical laboratory in Britain, from Canada, France, Switzerland, Greece, Italy, Norway, Sweden, Denmark, Spain, Holland, and Japan; and there are also British Ramsay Fellowships, including one specially connected with Glasgow, Ramsay's *alma mater*. From the remainder of the fund, 25,000*l*. is being devoted to a laboratory of chemical engineering at University College, London, where Ramsay taught and worked for 26 years; there, also, an annual Ramsay medal has been founded.

The Abbey bronze, which was executed by Mr. C. L. Hartwell, A.R.A., is illustrated in the accompanying photograph (Fig. 1). The artist has been compelled, owing to the nature of the only position available in the Abbey, to give to the eyes a downcast expression which in life they rarely assumed. Probably no medium could convey the inward and outward sparkle which lit Ramsay's eyes under their characteristically lifted brows; and his open glance and the quick charm of his smile defy portrayal.

As a chemist, Ramsay had three great gifts in nearly equal degree: boldness of imagination, amazing audacity in conceiving experiments, and extraordinary constructional and manipulative deftness in carrying them out. Of his earlier researches the importance is exemplified by his discovery of the nature of Brownian movement, by the work embodied in the Ramsay-Young equation, and by that which gave the Ramsay-Eötvös method for measuring molecular association in liquids. In 1894, he alone of chemists had the courage to see in Rayleigh's abnormal nitrogen-densities the indication of a new atmospheric element and to seek it and find it; his discovery of helium came as a dramatic reward for a search after further sources of argon; and with the advent of liquid air he, with Travers, drove on with irresistible impetus to the detection and isolation of neon, krypton, and xenon. Only Berzelius has discovered as many new elements; no one but Ramsay has laid bare a complete and unforeseen group. In radioactivity he found fresh scope; and the experimental proof that helium is generated during radioactive change founded the era of the transmutation of elements. Possibly the finest example of his skill was given when, with Whytlaw-Gray, he measured the density of one-thousandth of a milligram of gaseous radium-emanation—the last member of his own group of inert gases.

Like Priestley and Davy, Ramsay opened up a new world for science; and physics, chemistry, and even astronomy are enriched, not alone by the discoveries which he made, but also by the methods which he devised and so freely handed on to others. I. M.

S. P. Langley's Pioneer Work in Aviation.[1]

By Prof. L. BAIRSTOW, C.B.E., F.R.S.

THE work of Prof. S. P. Langley in aviation is such a first-rate example of systematic inquiry—of a type rightly called scientific—that no excuse is needed in again directing attention to it. Progress was made step-by-step in the face of formidable difficulties, and no attempts were made to solve the problems of mechanical flight by bursts of brilliance or invention. The scientific method appears to be most suitable for the great bulk of human endeavour and is required in the interpretation and development of striking innovations.

Langley was a creative investigator and not merely a producer of data. It is probably not wide of the mark to say that his experimental results are now rarely appealed to, yet who can doubt that the whole course of aviation was largely determined by his efforts? Langley's work may be divided into two periods—1887 to 1896, and 1896 to 1903. The end of this period is almost coincident with the earliest successes of the Wright Brothers. The later Hammondsport trials on a modified Langley aeroplane have obscured the real issue, and it is better to leave these out of account as having nothing to do with Langley and his methods.

The story can be readily told in extracts from the originals; in 1901 Langley said:

"And now, it may be asked, what has been done? This has been done: a 'flying machine,' so long a type for ridicule, has really flown; it has demonstrated its practicability in the only satisfactory way—by actually flying—and by doing this again and again under conditions which leave no doubt.

"There is no room here to enter on the consideration of the construction of larger machines, or to offer the reasons for believing that they may be built to remain for days in the air, or to travel at speeds higher than any with which we are familiar. Neither is there room to enter on a consideration of their commercial value, or those applications which will probably first come in the arts of war rather than those of peace; but we may at least see that these may be such as to change the whole conditions of warfare, when each of two opposing hosts will have its every movement known to the other, when no lines of fortification will keep out the foe, and when the difficulties of defending a country against an attacking enemy in the air will be such that we may hope that this will hasten rather than retard the coming of the day when war shall cease."

This note was written before the advent of the man-carrying aeroplane—two years before. Some of the prediction is yet unfulfilled, particularly that as to remaining for days in the air, but it accurately anticipated war uses before civil. In continuing his story Langley shows that he had no commercial interests in his efforts:

"I have thus far had only a purely scientific interest in the results of these labours. Perhaps if it could have been foreseen at the outset how much labor there was to be, how much of life would be given to it and how much care, I might have hesitated to enter upon it at all. And now reward must be looked for, if reward there be, in the knowledge that I have done the best in a difficult task, with results which it may be hoped will be useful to others. I have brought to a close the portion of the work which seemed to be specially mine—the demonstration of the practicability of mechanical flight—and for the next stage, which is the commercial and practical development of the idea, it is probable that the world may look to others. The world, indeed, will be supine if it do not realise that a new possibility has come to it, and that the great universal highway overhead is now soon to be opened."

This passage is of extreme interest; it emphasises the scientific spirit and the relation of science to industry. Monetary reward did not come to Langley, nor did the merits of his work save him from biting criticism in the press on the failure of his man-carrying aeroplane. Time has probably enabled us to take a more detached and fairer view. These early remarks by Langley prepare us for a note by his assistant, Mr. Manly:

"In the spring of 1904 after the repairs to the main frame were well under way, the writer [Mr. Manly] on his own initiative undertook to see what could be done towards securing for Mr. Langley's disposal the small financial assistance necessary to continue the work; but he found that while a number of men of means were willing to assist in the development of the aerodrome [aeroplane] provided arrangements were made for later commercialisation, yet none were ready to render assistance from a desire to assist in the prosecution of scientific work." On the other hand, Langley "had given his time and his best labours to the world without remuneration, and he could not bring himself at his stage of life to consent to capitalise his scientific work."

The problem of financing and directing scientific research is seen here as a striking example of the failure of our systems. The troubles still exist in large measure, and much has yet to be learnt before science and industry combine for efficiency and economy. The relation caused comment by Manly to the effect that:

"Persons who care only for the accomplished fact may be inclined to underrate the interest and value of this record [1911]. But even they may be reminded that but for such patient and unremitting devotion as is here enregistered, the new accomplished fact of mechanical flight would still remain the wild unrealised dream which it was for so many centuries."

Throughout his writings, Langley made a clear distinction between two subjects which he called "aerodynamics" and "aerodromics"—a distinction which still exists but is differently described. His division corresponds very closely with the modern expressions "performance" and "control and stability," both being now regarded as branches of aerodynamics. The scientific advisers of the Air Ministry are more and more turning to the study of "aerodromics," on which progress towards safety in flying is seen largely to depend. Its problems are still very difficult. In concluding this note probably the best summary is Langley's own:

"I am not prepared to say that the relations of power, area, weight, and speed, here experimentally established for planes of small area, will hold for indefinitely large ones; but from all the circumstances

[1] Extracted from an address delivered as chairman of the Royal Aeronautical Society on October 5.

of experiment, I can entertain no doubt that they do so hold far enough to afford assurance that we can transport (with fuel for a considerable journey and at speeds high enough to make us independent of ordinary winds) weights many times greater than that of a man." And

"I desire to add as a final caution, that I have not asserted that planes such as are here employed in experiment, or even that planes of any kind are the best forms to use in mechanical flight, and that I have also not asserted, without qualification, that mechanical flight is practically possible, since this involves questions as to the method of constructing the mechanism, of securing its safe ascent and descent, and also of securing the indispensable condition for the economic use of the power I have shown to be at our disposal—the condition, I mean, of our ability to guide it in the desired horizontal direction during transport,—questions which, in my opinion, are only to be answered by further experiment, and which belong to the inchoate art or science of aerodromics, on which I do not enter."

The problems of Langley are still problems, and we have very much to learn about the control of aeroplanes. An interesting commentary on Langley's work is provided by the fact that on October 19 the world's record for gliding flight was obtained on a replica of the Langley machine and not by a glider following the modern conventional aeroplane. It would be wrong, I think, to argue superiority of type for the successful glider, but it is a not unwelcome reminder of the enormous progress made by a scientific pioneer at a time when science in aviation is at a very low ebb.

The Early History of the Land Flora.[1]

By Dr. D. H. SCOTT, F.R.S.

II.

WHEN we reach the Upper Devonian flora we find ourselves in the midst of a comparatively familiar vegetation. A few of the early forms may have survived, but the bulk of the plants were highly organised Vascular Cryptogams or Spermophytes. While in the Early Devonian no true Ferns have been found, a branched, naked rachis being the nearest approach to a frond, the later vegetation has been called the Archæopteris flora, after the magnificent ferns or fern-like plants of that genus, of which the famous *A. hibernica* is the type. We do not, however, know for certain whether these fine plants were really Ferns, or fern-like seed-plants. The presence of true Ferns is more surely attested by Dawson's Asteropteris, from the State of New York, which has the structure of a Zygopterid, a group well known from Carboniferous rocks. Lycopods had attained a very high development, as shown especially by the genus Bothrodendron, of which the large heterosporous cones are known.

The now extinct group of the Sphenophyllums, characteristic of Carboniferous times, had also made its appearance in the Upper Devonian flora; the whorled leaves of these early forms were deeply cut, not wedge-shaped as in most of the later representatives. Nathorst's genus Hyenia, which already appears in the Middle Devonian, may probably have been a precursor of the Sphenophylls.

Another family, represented by Pseudobornia, of Nathorst, from Bear Island, is only known from the Upper Devonian. It was a large plant, with whorled leaves, palmately divided, and further cut into narrow segments, while the long cones are believed to have produced spores of two kinds. Pseudobornia is at present quite isolated; its affinities may be either with the Sphenophylls or the Horsetails. Apart from this case, the Equisetales do not appear to be represented among our present Devonian records, for the evidence for the occurrence of Archæocalamites at that period seems to be inadequate. The group, however, was so well developed in Lower Carboniferous times that there can be no doubt it had appeared long before.

[1] Continued from p. 607.

The best proof of the presence of seed-plants in the Upper Devonian is to be found in the occurrence of petrified stems, which, from their organisation, must presumably have belonged to advanced Gymnosperms. The genus Callixylon, apparently allied to the Lower Carboniferous Pitys, has a peculiar and beautiful structure in the secondary wood, the pits being localised in definite groups. The wood appears more highly differentiated than that of most living Conifers.

Thus the main lines of subsequent evolution were already well laid down in Upper Devonian times. We know practically nothing of their origin. Some botanists believe that the higher plants may have had a common source in some group, already vascular, such as the Psilophytales, while others hold that the main phyla have always been distinct, from the Algal stage onwards. The existence of these rival monophyletic and polyphyletic hypotheses, both maintained by able protagonists, shows how little definite knowledge of the evolutionary history we possess.

The Lower Carboniferous flora bears a close general resemblance to the Upper Devonian, but is much better known. The wealth of forms is, indeed, so great, that only the merest outline of the main features can be given here.

The Lycopods were abundantly developed. Many species of Lepidodendron and Lepidophloios are known, not only by external characters, but often by anatomical structure. While the primary ground plan of their anatomy was not unlike that of some of the simpler Lycopods of our own day, most of the old forms developed a considerable zone of secondary wood, and a massive periderm. They were, in fact, adapted to play the part of forest trees. The genus Sigillaria, however, so important in the Upper Carboniferous flora, was still scantily represented.

As regards their fructification, the Lower Carboniferous Lycopods had attained the highest level which the class ever reached. Not only were their cones constantly (so far as observed) heterosporous, with an extreme differentiation of the two kinds of spore, but some of them even developed a kind of seed, a structure quite unknown among Club-mosses of later than Carboniferous age. In the seed-like fructification

(Lepidocarpon) a single megaspore only came to maturity, constituting the embryo-sac, while an integument, like a seed-coat, grew up round the sporangium.

The prothallus is sometimes well preserved, both in the seed-like bodies and in the more ordinary megaspores. In the latter (*Lepidostrobus Veltheimianus*), Dr. Gordon has recorded a perfectly typical archegonium, showing that the details of reproduction in these old Lycopods were the same as in their modern heterosporous representatives.

The best-known member of the Horsetail race was Archæocalamites, remarkable for the long leaves, often repeatedly forked, very different from the foliage which we are accustomed to associate with the Equisetales. The later Calamites were more or less intermediate in this respect. Anatomically, the Calamites, whether of Lower or Upper Carboniferous age, developed much secondary wood, and, like many contemporary Lycopods, became trees. The Lower Carboniferous Protocalamites is remarkable for possessing primary wood, centripetally formed, thus presenting some analogy with the Sphenophylls, in which this tissue is highly developed.

The cones attributed to Archæocalamites are, curiously enough, intermediate in structure between modern Equisetum cones and those of the Upper Carboniferous Calamites, for sterile bracts were either absent, or developed only at long intervals. In Equisetum, of course, they are absent altogether, while in the well-known Calamostachys and allied Upper Carboniferous fructifications, the sterile whorls are equal in number to the alternating fertile verticils. It must be admitted, however, that our knowledge of Lower Carboniferous fructifications of this group is still somewhat scanty.

The Sphenophylls of the period were already very advanced, and in the genus Cheirostrobus appear to have reached their zenith. The great cones of this striking plant, with their elaborate and perfect apparatus of compound sporangium-bearing organs, and protective sterile appendages, are certainly the most complex cryptogamic fructifications known, from any period. Thus, in certain directions, the Lower Carboniferous plants had attained a height of development which has never since been equalled.

Sphenophyllum itself still had, for the most part, the deeply cut leaves of the Upper Devonian species. Where the anatomy is known (*S. insigne*, from Burntisland), it is of the same general type as in the later Upper Carboniferous forms, but apparently somewhat less specialised. It is worth remarking, that all the Sphenophyllums formed secondary wood, though they were small plants. Thus growth in thickness by cambium was not confined to arborescent forms in Palæozoic times, any more than it is now.

As regards the affinities of the Sphenophylls, some relation to the Horsetail stock seems evident, as indicated by the whorled leaves, the general organisation of the cones, and the detailed structure of the sporangia. Presumably these two lines sprang from a common source, but what it was is still unknown. Further affinities, once suggested, with the Lycopods and the recent Psilotaceæ have not been confirmed and are probably illusory. Neither has Lignier's hypothesis of a common origin of both branches of the Articulatæ from Ferns, gained any support from the fossil record. The Articulatæ, as a whole, remain a completely isolated phylum.

The Ferns of the Lower Carboniferous were well developed and varied. We meet with the usual difficulty in distinguishing between the fronds of true Ferns, and those of the so-called "Seed-Ferns," which simulated them in habit. Where, however, anatomical characters are available, we find no approximation whatever between the two groups. Pteridosperms and Ferns at all times show themselves perfectly distinct, whenever our knowledge admits of an adequate comparison.

We have fairly abundant structural material of Lower Carboniferous Ferns, but it seems that practically all of it represents the group called Primofilices by Arber, who by this name meant to suggest age, not primitiveness. They were curious plants, and many of them must have been very unlike any Ferns now living. Unfortunately, our knowledge of their habit is by no means equal to that of anatomical detail.

The chief family in the Lower Carboniferous is that of the Zygopterids, of which several genera are represented. As we have seen, this family had already appeared in Upper Devonian times. The vascular cylinder of the stem shows some differentiation of the wood into a central region (either a mixed pith or a core of small, short tracheids), and a wide outer zone of larger elements. The petiole always has a peculiar structure, with a bilateral strand (often of complex form) giving off branch-bundles to the right and left. It is remarkable that the genus Clepsydropsis, once thought primitive on account of its simple petiolar structure, has been shown to possess an exceptionally high organisation of the stem.

The most striking point is the morphology of the frond. Even where there were only two series of pinnæ (as in normal compound leaves) their plane was not parallel to that of the main rachis, but at right angles to it. Moreover, in several genera there was the greater peculiarity that the pinnæ were in four rows, two rows on each side, a condition unexampled in ordinary leaves. In Stauropteris this quadriseriate branching was repeated in successive ramifications, so that the form of the whole frond was compared by Lignier to a bush. In this genus it is practically certain that the leaflets had no blade, and throughout the family there is rarely any proof of its presence.

The other Lower Carboniferous family of Primofilices, the Botryopterideæ, is at present represented for that period by a single species, the *Botryopteris antiqua* of Kidston, a plant in all respects of simpler organisation than the Zygopterids, and apparently more like an ordinary Fern.

Sporangia are known in several cases. Those of Stauropteris were borne singly on ultimate branches of the frond; they had no annulus, and are very similar to the sporangia associated with the Early Devonian Asteroxylon. In the fructification attributed to Diplolabis the sporangia are grouped in a sort of synangium, while those associated with Botryopteris have a biseriate annulus.

Both families show some affinity with the older members of the Osmundaceæ, while a relation to the Adder's Tongues has also been traced. But in both directions the connexion seems to be somewhat remote.

We are dealing, in the Lower Carboniferous Primofilices, with early races, already specialised on their own lines, and probably only indirectly connected with the main current of Fern-evolution.

The "Seed-Ferns" or Pteridosperms appear to have attained a great development in Lower Carboniferous times. A considerable variety of seeds is met with, and in some cases there is strong evidence for attributing them to plants with a fern-like foliage. In one such example, described by Nathorst, the seed (Thysanotesta) is remarkable for having a distinct pappus; it was thus adapted to wind-dispersal, like the achenes of Composites.

No less than six families, referred to Pteridosperms, are known by their anatomy. In only one is there any evidence as to the seed, but all these groups show, in their structure, a nearer relation to known "Seed-Ferns" than to any other phylum. The case referred to is that of Heterangium, a genus with a solid wood and no pith. A beautifully organised seed (Sphærostoma, Benson), obviously related to that of the Upper Carboniferous Lyginopteris, is found in close association with *Heterangium Grievii* and probably belonged to it. The two genera, Heterangium and Lyginopteris, are closely related, as shown by Dr. Kubart's discovery of intermediate anatomical features, in species of Millstone Grit age.

The Lyginopterideæ extend to the Upper Carboniferous, but the other five anatomical groups are peculiar to the Lower.[1] They show a great variety in structure, but none of them bear any anatomical resemblance to contemporary Ferns. Our knowledge of so many, more or less isolated, types indicates that we have only found a few relics of what was really a most extensive class of plants.

The family most richly represented is that of which Calamopitys is the type. A number of species of Calamopitys are known; they are plants with a pith (sometimes "mixed"), large leaf-trace bundles, and much secondary wood. The petioles, often of large size and with many vascular strands, have long been known as Kalymma. Some of the species, with dense secondary wood of a Coniferous type, have been separated by Dr. Zalessky under the name Eristophyton. An interesting new genus, Bilignea, in which the pith is replaced by a central column of short tracheids, has been discovered by Dr. Kidston.

[1] Space does not admit of any account of their remarkable characters. The five type-genera are: Rhetinangium, Stenomyelon, Protopitys, Cladoxylon and Calamopitys.

Apart from the "Seed-Ferns," we have the remarkable Lower Carboniferous family of the Pityeæ, already represented, as we have seen, in the Upper Devonian. Pitys was a genus of trees, with a relatively large pith traversed by slender strands of wood, while the secondary wood was of an Araucarian type. The foliage was quite unknown until recently, when Dr. Gordon discovered the leaves attached to the twigs in a species from the shores of the Firth of Forth. The leaves are totally different both from those of any Pteridosperm and from the well-known foliage of the Upper Carboniferous Cordaiteæ; they rather resemble the needles of a Fir, though more complex in structure. Dr. Gordon suspects an affinity with Araucarian Conifers.

Perhaps the chief conclusion that follows from this hasty sketch of the earlier floras is the great distinctness of the main phyla.

The Lycopods may perhaps become merged, as we trace them back, in the early Devonian Psilophytales, but nowhere approach any other group.

The Articulatæ appear as an isolated phylum throughout.

The Ferns may have come from thalloid plants, through some of the forms of Early Devonian age, where the frond is only represented by a bladeless rachis. The "Seed Ferns" now appear as a totally distinct line, parallel in certain respects to the true Ferns, but nowhere joining them, unless it be in some common thalloid source, about the Psilophytales level.

The higher Gymnosperms, represented in the period considered by Pitys and its allies, may have passed through an earlier Pteridosperm stage, but this is not proven. The Spermophyta generally may, for all we know, be as ancient as any other vascular plants.

Thus phylogeny still eludes us, though it remains the ultimate goal of the palæontologist.

Obituary.

DR. C. G. KNOTT, F.R.S.

THE sudden death of Dr. C. G. Knott, reader in applied mathematics in the University of Edinburgh, and general secretary of the Royal Society of Edinburgh, has deprived physical science of a devoted follower and an accomplished exponent. On Wednesday, October 25, he was lecturing as usual and attending, in the afternoon, to the business of the Royal Society. At night he was taken ill and died of heart failure in a few hours.

Born at Penicuik in 1856, Knott entered the University of Edinburgh in 1872 and soon joined a little band of enthusiastic workers in the laboratory of Prof. Tait. To study under that great teacher was a privilege and an inspiration. The laboratory, then a new feature in university physics, was a small attic, meagrely equipped. Only a few of the best pupils cared to seek admission; they plunged at once into research, either sharing in the investigations on which Tait happened to be engaged, or undertaking some independent inquiry of their own. Tait was then collecting data for his thermoelectric diagram, and Knott's training was to measure the electromotive forces between pairs of some twenty different metals, through a wide range of junction temperatures. He also began the series of magnetic researches he was afterwards to pursue with the help of his own Japanese pupils. In 1879 he was appointed Tait's assistant, but gave up that post in 1883 when he became professor of physics in the University of Tokyo. After eight years as professor in Japan he returned, in 1891, to his own University of Edinburgh, where he spent the rest of his life, at first as lecturer and later as reader in applied mathematics. He also acted as the official adviser of students reading for honours in mathematics and physics, or for degrees in science—a task which his wide knowledge, his unfailing good nature, his geniality, his ready sympathy, and his infinite capacity for taking pains, fitted him to discharge to the great advantage of many generations of undergraduates. For the last ten years he also held the office of general secretary in the Royal Society of Edinburgh, where the same characteristics found further exercise, along with others which eminently qualified him for editorial work.

In Japan, with pupils such as Nagaoka, Knott's influence as a teacher soon became conspicuous, and has proved enduring. His love of research was infectious. The school of young Japanese seismologists and magneticians, then in its infancy, owed much to his example and encouragement. Along with Tanakadate, he carried out a magnetic survey of "all Japan." His industry was untiring and the habit of research, formed in his student days, never left him. All his scientific work is sound and thorough. His published papers, more than seventy in number, cover a wide range, but the subjects of ferro-magnetism, especially in its relation to strains, and of seismology, continued to engage his main attention. His book on the physics of earthquake phenomena, published in 1908, is an admirable digest of the whole subject, linking up the older with the newer seismology. His last long paper, published by the Royal Society of Edinburgh in 1919, completed a series in which the theory of earthquake-wave propagation is discussed with much originality.

Probably the best known of Knott's books is his Biography of Tait (Camb. Univ. Press, 1911). No other disciple was so fit to undertake the difficult task of writing the life of the master, for on Knott the mantle had most directly fallen, and he, more than any, continued to wear it. Tait himself, in a preface to his collected papers, speaks of Knott as an adept in quaternions as well as in physics, and adepts in quaternions have always been rare. Knott's grasp of mathematical methods, his intimacy with Tait's work and appreciation of Tait's genius, and above all his affectionate comprehension of an often whimsical personality, inspired him to write what is beyond question an exceptionally adequate and deeply interesting biography. More recently he organised the Napier tercentenary (1914), and edited the memorial volume. Almost his last act was to pass for the press the final sheets of collected papers by the late Dr. John Aitken, F.R.S.

An unselfish, modest, Christian gentleman, whose life was a constant round of unobtrusive service, Knott is mourned by many friends. J. A. E.

BY the death of Thomas Francis Moore the National Museum, Melbourne, has lost one of the most valued members of its staff. Mr. Moore had filled the position of osteologist at that institution for nearly twenty-two years. His work was of a very high order and universally known. As a link with the past, it may be mentioned that Mr. Moore's father, Mr. T. J. Moore, was for forty years curator of the Liverpool Museum, and from 1865 to 1884 organised and took part in the Liverpool Free Public lectures. Dr. Frederick Moore, of the East India Company's Museum, well known by his work on oriental Lepidoptera, was an uncle of Mr. T. F. Moore.

THE *Chemiker Zeitung* of October 17 reports the death, at the age of sixty-four years, of Prof. Lassar-Cohn, who had occupied the chair of chemistry at Königsberg since 1894. His work was mainly in the fields of organic and technical chemistry, and his text-books were well known in English translations.

Current Topics and Events.

THE following is a list of those recommended by the president and council of the Royal Society for election to the council at the anniversary meeting on November 30:—*President*: Sir Charles Sherrington; *Treasurer*: Sir David Prain; *Secretaries*: Mr. W. B. Hardy and Dr. J. H. Jeans; *Foreign Secretary*: Sir Arthur Schuster; *Other members of Council*: Prof. V. H. Blackman, Prof. H. C. H. Carpenter, Prof. T. R. Elliott, Prof. A. Harden, Sir Sidney Harmer, Prof. W. M. Hicks, Prof. H. F. Newall, Prof. G. H. F. Nuttall, Prof. D. Noel Paton, Lord Rayleigh, Prof. O. W. Richardson, Sir Ernest Rutherford, Dr. Alexander Scott, Mr. F. E. Smith, Sir Aubrey Strahan, and Prof. J. T. Wilson.

IT is announced in *Science* that Dr. S. W. Stratton, director of the Bureau of Standards at Washington for the past twenty-one years, has been elected president of the Massachusetts Institute of Technology. Dr. Stratton was professor of physics and electrical engineering at the University of Illinois and professor of physics at the University of Chicago before his appointment as director of the Bureau of Standards in 1901; he found the department a small office employing three or four people, and from it he built up the present department with a staff of about 900. Commenting on Dr. Stratton's resignation, Mr. Hoover is reported by the *New York Times* to have said: "The Massachusetts Institute of Technology, an educational institution, finds no difficulty in paying a man of Dr. Stratton's calibre three times the salary the government is able to pay him." It appears that it is impossible to live and to provide for old age while at Washington on a government salary, and for this reason it is difficult to induce men of science to undertake responsible national posts.

PROF. A. SMITHELLS' retirement at the end of the present session from the chair of chemistry of the University of Leeds, after thirty-eight years of active work, will be a serious loss to the whole educational world as well as to the narrower sphere of academic life of the University in the progress and development of which he has played so conspicuous and devoted a part. His intention in retiring is to employ part of his leisure in literary and scientific work with which his present multifarious duties, not only as head of a very large and busy department, but also as member of numerous university committees and outside public bodies, seriously interfere.

THE use of the cinema as a means of agricultural education among farmers is in contemplation in this country, and at least one organisation is understood to be preparing a set of films. A recent announcement in *Le Matin* indicates that France may, however, be first in the field. It is stated that the Ministry of Agriculture has submitted to the President of the Republic an order authorising an annual grant of 500,000 francs for the purpose of installing, in agricultural colleges and schools and in the rural communes, cinematographic appliances which would be used for the popularisation of scientific agriculture. There is no question that the cinematograph could serve a highly useful purpose; it is not only more attractive than the lantern slide, but it brings out points that could not otherwise be readily shown. It may be doubted whether the ordinary lantern slide could be dispensed with, however, and the lecturer of the future will probably try to use both films and slides.

AT the International Congress of Eugenics held in New York in 1921 an International Commission of Eugenics was re-formed from a previously existing committee. This committee held its first annual meeting at Brussels on October 7 and 9. By a unanimous vote it was decided to invite Germany to co-operate in its labours in the future, delegates from the United States, France, Denmark, Holland, Norway, together with Major Darwin, the chairman, and Dr. Govaerts of Belgium, the secretary, being present. The Société Belge d'Eugenique held a series of conferences at the same time, at which interesting papers were read. This society is to be congratulated on the assistance it is now receiving from the Solvay Institute, both as regards quarters and funds.

UPWARDS of eighty members and visitors attended the last conversazione of the Natural History Museum Staff Association for the current year, which was held in the Board Room on November 1. Among the many interesting exhibits placed round the room may be mentioned the following: A selection of birds collected in the course of the Shackleton-Rowett Expedition to the Antarctic regions by the *Quest*; life-size casts of the dolphins recently received by the Museum from Tung Ting Lake, China, about 800 miles from the sea; a series of specimens illustrating sporadic variation in plaice and flounder; life-size models in colour of toads and frogs shortly to be placed in the exhibition gallery; enlarged model of an extinct marine arthropod found in the Upper Silesian rocks of Oesel in the Baltic; examples of tropical spiders which have been discovered alive in this country; a selection of the butterflies collected in the course of the Mount Everest Expedition 1922, and a small fragment of the rock (biotite-schist) at the highest point reached by the climbing party; diagrams of genera of British Carboniferous corals, and others illustrating the distribution of mammals in Africa; and specimens illustrating the introduction of the chrysanthemum into this country in the eighteenth century. In addition, Mr. O. H. Little showed beaded casts of crustacean or worm tracks from the Nubian sandstone at Wady Arabah, Egypt. Messrs. James Swift and Son exhibited recent models of their microscopes and accessories, and Messrs. Baird and Tatlock showed examples of glassware and other apparatus for museum and laboratory use.

THE Society of Chemical Industry, which was founded in 1881 for the promotion of applied chemistry and chemical engineering, has now a roll of some 5500 members scattered over all parts of the world. No less than eighteen local sections have been formed at home and abroad, each section having its own officers and programme, and leading to some extent an independent existence. There is also a chemical engineering group, which has its headquarters in London. The Edinburgh and East of Scotland section has included in its programme an address by Prof. G. Barger on some recent advances in biochemistry and another by Prof. H. S. Allen on modern theories of the structure of the atom, the latter being a joint meeting with the Glasgow section, the Royal Scottish Society of Arts, and the local section of the Institute of Chemistry. The programme of the Liverpool section is more industrial; papers have been arranged dealing with bleaching agents for textiles and paper pulp, chemical industry during the war in Great Britain and France, saponification of fatty oils, patent fuels, synthetic tannins, fractional distillation, and sulphur. These two programmes are wide and varied in their appeals, and serve to show the range of the society's activities.

THE report of the council of the North-East Coast Institution of Engineers and Shipbuilders for the year 1921–22, which has recently been issued, marks the close of the thirty-eighth session of the society. In addition to the presidential address by Sir William J. Noble, thirteen papers were presented at meetings during the session, and twelve are printed in the Transactions. They cover a wide field, there being three papers dealing with naval architecture, three with internal combustion engines, two with electrical and two with mechanical engineering, in addition to a paper on casualties at sea and another on standardisation. The roll of the society in July contained 1594 names, of which 486 were those of members, 542 of associate members, and 388 of graduates. The society benefited by two gifts of 500*l*. during the year; one was from Mr. A. E. Doxford, a past president, for the endowment fund, and the other from the Furness Shipbuilding Co., Ltd., to provide an income for the newly formed Middlesborough branch. The Graduate Section had a successful session, including, in addition to its formal meetings, a number of visits to works. Study circles inaugurated in 1920, specialising in the internal combustion engine and strength of ships, continued to meet. A programme of the papers to be read and the works' inspections arranged for the Graduate Section during the current session has been issued and gives promise of an interesting and instructive series of meetings.

THE tenth annual meeting of the Indian Science Congress, under the auspices of the Asiatic Society of Bengal, will be held at Lucknow on January 8–13, 1923. The congress will be opened by Sir Spencer Harcourt Butler, Governor of the United Provinces, who has consented to be patron. The president of the congress is Sir M. Visvesvaraya, and the presidents of the sections are as follows: Agriculture — Dr. Kunjan Pillai, Trivandrum; Physics — Dr. S. K. Banerji, director of the Observatory, Colaba, Bombay; Chemistry—Dr. A. N. Meldrum, Royal Institute, Bombay; Botany — Mrs. Howard, Pusa; Zoology — Prof. G. Matthai, Government College, Lahore; Geology — Dr. Pascoe, Indian Museum, Calcutta; Medical Research — Lt.-Col. Sprawson, Lucknow; Anthropology—Dr. J. J. Modi, Bombay. In addition to the regular programme of the meetings of the scientific sections, a series of general scientific discussions has been organised, beginning with one on colloids by Dr. S. S. Bhatnagar, of Benares. A series of illustrated public lectures on subjects of popular scientific interest has also been arranged, details of which will be announced later. Further particulars regarding the congress may be obtained from Dr. C. V. Raman, general secretary, Indian Science Congress, 210 Bowbazaar Street, Calcutta. The local secretaries at Lucknow are Prof. P. S. MacMahon and Dr. Wali Muhammad of the Lucknow University.

THE British Non-ferrous Metals Research Association has just issued a statement as to the investigations already in hand and the work being undertaken by the Association. The record is one of active work, and is to be commended to other Research Associations as a model to be imitated. The practice has been to allot the investigations to existing laboratories of sufficient standing, the work being carried out under the direction of the chief of the laboratory in consultation with the Director of Research, Dr. R. S. Hutton. The subjects in which progress has already been made are: effect of small quantities of impurities on the properties of copper; conditions of obtaining sound ingots of brass; methods of jointing metals; abrasion and polishing of metals; atmospheric corrosion; properties of rolled nickel-silvers; influence of oxide on aluminium; and cause of red stains on finished brass. Information has also been collected respecting the electric melting of non-ferrous metals. In regard to the first of the subjects mentioned, the effect of oxygen on copper has been studied in detail and the effect of other elements is now being examined. The laboratories with which arrangements have been made include the National Physical Laboratory; the Universities of Birmingham, Sheffield, and Manchester; the Research Department, Woolwich; the Royal School of Mines, and the Research Department of Metropolitan Vickers, Ltd. The pamphlet also contains particulars of the means adopted for circulating information among members, and concludes with an outline of the future work proposed for the Association.

A STATE Institute of Radiology has been established at Prague, under the direction of Dr. Felix.

IN consequence of the great demand for seats at the joint meeting of the Royal Geographical Society and Alpine Club for the Mount Everest film lecture on November 21 at the Central Hall, London, it has been found necessary to arrange two meetings —for the afternoon at 3 P.M. and the evening at 8.30 P.M.

A PRIZE of 1000 guineas has been offered by Messrs. Selfridge and Co., through the Royal Aero Club, for the first flight of fifty miles made by a British pilot on a British-built glider, the distance to be measured in a straight line from a given point of departure. The prize will remain open for a year from January 1, and if it is not awarded, a prize of five hundred guineas will be given for the longest flight of more than twenty-five miles during the year.

IT is announced in *Science* that the Howard N. Potts Medal of the Franklin Institute has been awarded to Dr. Charles Raymond Downs and Mr. John Morris Weiss of New York " in consideration of their notable achievement in the scientific and commercial development of the catalytic vapour-phase oxidation of benzene to maleic acid and their pioneer work in developing a commercial process for changing aromatic to aliphatic compounds."

WE have referred in these columns from time to time to the preparations which are being made in France to celebrate the approaching centenary of the birth of Pasteur. British men of science have had an opportunity of sharing in the celebrations and we now learn from *Science* that the New York Academy of Medicine is organising an exhibition in commemoration of the event. The exhibition, which will be opened on December 27, will consist of a collection of books, manuscripts, photographs, engravings, etc., illustrating the life and work of Pasteur, and will conclude with a number of addresses by distinguished members of the medical profession.

A NEW Danish expedition to the Sahara is announced in the *Times*. Under the leadership of Prof. Olufsen, the expedition will shortly leave Tunis for the Shat-el-Jerid. From Nefta it will go by Tuggurt to Wargla in the Algerian Sahara, and thence to Insalah, and endeavour to explore the Hoggar Mountains. The members of the expedition will include Dr. Gram, botanist, Drs. Storgaard and Kayser, geologists, and Prof. Bourcart, of the Sorbonne. Dr. Olufsen expects that the journey will occupy some six months.

NEWS from Mr. K. Rasmussen brings the story of his researches in Baffin Land and the Hudson Bay region down to the end of July. According to the *Times* the winter work was carried out according to programme. Surveys were made of the north coast of Fury and Hecla Straits, and that part of Baffin Land between Gifford Bay and Admiralty Inlet. Mr. Rasmussen himself was chiefly engaged in his researches on the migration routes of the Eskimo, and in order to become acquainted with the local dialect stayed several months in a small Igdlulik settlement at Cape Elisabeth. At the end of March Mr. Rasmussen, with two companions, left for Chesterfield Inlet on his way to the Aivilik and Netjilik tribes. Baker Lake was reached early in May and Yathkied Lake in June. From there the party returned in July to Chesterfield Inlet. The country between Chesterfield Inlet and Yathkied Lake is inhabited mainly by pronounced inland tribes of Eskimo who only during recent decades have begun migration to the sea coast. They live on bad terms with the nearest Indian tribes, and some of them had never seen white men. Their legends often agree in minute detail with the Greenland legends: their religion is on a much lower level. Mr. Rasmussen considers these tribes to be the most primitive that he has ever met: this is also shown in weapons, houses, and boats. Everything connected with the sea is taboo. The stone houses are unheated, as no blubber is available. Salmon fishing and reindeer hunting are the only means of livelihood, and starvation is not an uncommon experience of these tribes. Steensby's theory that the Eskimo were originally inland American people receives support from these discoveries. The inland tribes which Mr. Rasmussen studied very likely may be the last survivals of the primeval Eskimo who have not yet reached the sea.

PROF. LEONARD HILL delivered a Chadwick Public Lecture on "Ventilation and Atmosphere in Factories and Workshops" on October 26. Prof. Hill emphasised the fact that it is not the relative humidity that matters, but the actual vapour pressure of the air coming in contact with the skin; the breathing of cool air entails more evaporation from the respiratory membrane and consequent greater outflow of lymph through the secretion of fluid from it. Thus the membrane is better washed and kept clean from infecting microbes. The open-air worker is thus better protected, and moreover escapes the massive infection from carriers which occurs in shut-up rooms. Wet-bulb temperatures in factories and mines are physiologically more important than dry-bulb temperatures; the velocity of the air is an important consideration, for on this chiefly depends cooling by convection and evaporation. The cooling and evaporating powers of an atmosphere can be measured by the kata-thermometer, a large-bulbed spirit thermometer. Furnace- and engine-rooms should be ventilated by fans at the bottom of wide trunks down which cool air naturally sinks, the fan breaking up the air into fine streams. Rooms are best ventilated by open windows or a system of fans to impel cool fresh air through gratings about eight feet from the ground and extract it through apertures in the ceiling; floors and walls should be warmed by radiant heat from gas or coke fires.

THE Eastman Kodak Company of New York has issued the fourth volume of "Abridged Scientific Publications from the Research Laboratory of the Eastman Kodak Company," a volume of about 340 pages. It includes abridgments of 54 papers that have been published during the years 1919 and 1920 in various scientific journals and the proceedings of scientific societies. The abridgments are not mere expansions of the titles, as is too often the case just now, but useful and often long abridgments giving details of methods and results. At the end of the volume there is a complete list of all communications issued by the Laboratory (a total of 117), and indexes of authors and subjects for the four volumes. The subjects dealt with cover a very wide range. Besides those that are obviously related to photography, which are divided into nine sections, there are papers on photometry, colour measurement, sensitometry, photographic optics, physiological optics, chemistry, physical chemistry, electro-chemistry, colloids, and radiography. The volume is undeniable evidence of the activity of those who work in this Laboratory and of the broad views taken of the subject by the Director.

WITH reference to Dr. Hale Carpenter's letter describing a waterspout published in our issue of September 23, p. 414, we have received a letter from Mr. E. R. Welsh, Devon, Pa., U.S.A., in which he suggests that in a waterspout, centrifugal force would cause a partial separation of air and waterdrops, the waterdrops tending to concentrate in an outer sheath, while within the sheath there would be a region with lower waterdrop content; the continued existence of the central core would be provided by the uprush of spray from the surface of the water. Mr. Welsh suggests that the appearance of pulsation in the outer sheath might be explained by the rotation, combined with a spiral fluting of the sheath.

IN his presidential address before the Institution of Automobile Engineers, Colonel D. J. Smith warned the members that they must not allow themselves to be engrossed entirely in the technical aspect of the motor car; there are many other questions which might have a great effect on the well-being of the industry. He urged upon automobile engineers the necessity of not being content to design a car which would run on the comparatively good roads in this country. The local conditions in the various parts of the British Empire should be ascertained and steps taken to design cars to meet these conditions. The most suitable vehicle for any market captures that market, price being a secondary consideration. Col. Smith believes that the chief development in Great Britain would lie in the direction of vehicles carrying fourteen to sixteen people and luggage, which could compete with the railways in providing rapid and frequent passenger service, and so opening up rural districts in a manner not hitherto contemplated. He also criticised strongly the present methods of road construction, and likened the result to that which would prevail if the track of the L. & N.W. Railway were maintained by the different borough councils of the areas through which the track passes between London and Scotland, each employing its own unemployed and using local unsuitable material. In connexion with the carrying capacity of roads, the reduction due to tramway services was mentioned—a five minutes' service reduces the carrying capacity by 50 per cent., and a two minutes' service by 80 per cent. The country cannot afford tramways, and their comparatively early disappearance is certain. In reference to standardisation, Col. Smith urged that standards once decided upon should be used, and condemned the conception that a design would lose individuality by the adoption of standardised parts. Again, automobile engineers should not consider liquid fuel as the only fuel available. In many countries charcoal is available at prices which make it equivalent to petrol at a few pence per gallon. There is a need for a steam vehicle suitable for such fuel, and of a lighter type than those generally seen.

THE *Journal of Pomology* is to be made, in effect, the official organ of the horticultural research stations in England, and with this change the name of the journal will become the *Journal of Pomology and Horticultural Science*. Its scope will be widened and it will be under the control of a publication committee consisting of Prof. B. T. P. Barker, Horticultural Research Station, Long Ashton, Bristol; Prof. R. H. Biffen, Horticultural Research Station, Cambridge; Mr. E. A. Bunyard, Maidstone (Editor); Mr. H. E. Dale, Ministry of Agriculture; Mr. R. G. Hatton, Horticultural Research Station, East Malling, Kent; and Mr. H. V. Taylor, Ministry of Agriculture. The research stations at East Malling, Long Ashton, and Cambridge have assumed financial responsibility, It is anticipated that four numbers of the journal will be issued annually, the first of which will be ready this month.

A VERY comprehensive catalogue of works dealing with chemistry in all its branches has just been published by Messrs. Wheldon and Wesley, Ltd., 2 Arthur Street, New Oxford Street, W.C.2. Nearly 3000 publications (many of them rare) are listed under some 44 headings. Being carefully classified according to subjects the list should certainly be seen by readers of NATURE interested in chemistry.

Our Astronomical Column.

LARGE METEOR OF OCTOBER 17.—Mr. W. F. Denning writes: "This remarkable meteor was observed at Bristol, and also by Mr. W. Tidmarsh at Exeter at 11.46 P.M. on October 17. The radiant point was at 152° +39°. The luminous flight of the object was unusually long, and extended from over Stafford to a point in the English Channel about 30 miles south of Plymouth. The radiant point being near the horizon, the course through the atmosphere was almost parallel with the earth's surface. Its height declined from 71 to 62 miles, the path being about 225 miles long and the velocity 37 miles per second.

"This meteor was very similar in many respects to brilliant meteors which appeared on October 15, 1902, and October 22, 1919. Their radiant points were at 150° +43° and 156° +39° respectively. The comet of 1739 has a radiant point at 157° +39° on October 22, and may well have supplied the three bright meteors referred to above."

VARIABLE STARS.—Owing to the completeness of the data of variable stars of long period which are being sent in to Mr. Leon Campbell by his host of energetic observers, the Harvard College Observatory Bulletin, No. 776, announces that it is possible to estimate the approximate magnitudes of most of these stars for any given date several weeks ahead. It is therefore proposed to make the predictions one month in advance and to publish them bi-monthly. This arrangement is very satisfactory, because those who do not possess large instruments will be able to observe some stars when they are brighter than a certain magnitude, and will know when to commence the observations. Again, many of these stars are most interesting spectroscopically, and they can be followed when it is known that they are bright enough for the particular instrument the observer possesses. In this publication the variables are published in groups according as they become brighter than a certain magnitude after a certain date. Thus the date chosen here is November 1, 1922, and the variables are grouped as follows: those that will be brighter than magnitude 8·0; those that will be between 8·0 and 10·0; 10 and 12; 12 and 14; and fainter than magnitude 14.

THE DISTANCE OF THE CEPHEID VARIABLES.—Prof. Kapteyn and Mr. van Rhijn examined the proper motions of the galactic Cepheids of short period, and concluded that their distances were only about one-seventh of those given by the formula of Prof. Harlow Shapley, employed in Prof. Shapley's researches on the distances of the Globular Clusters. He replies to their paper in Circular 237 of Harvard College Observatory, giving reason to believe that the stars in question have unusually high linear velocity, which would affect the parallax derived from the proper motions. He shows that their apparent drift is not directed away from the solar apex, indicating that they have independent velocity. In several cases the spectroscope has confirmed this, the velocities 50, 51, 193, 74, 49 km./sec. being found in five cases. Shapley then quotes the recent work at the Sproul Observatory, where the parallaxes of the Cepheids have been trigonometrically examined, the results confirming the spectroscopic parallaxes. These stars are concluded to belong to the stream of high-velocity stars, found by Adams, Joy, and Strömberg at Mt. Wilson to have a space velocity of some 200 km./sec. Since this is comparable with the average line-of-sight velocity of globular clusters, it is conjectured that the galactic Cepheids may originally have been members of the same cluster, and be merely travellers passing through the solar cluster.

The spectroscopic parallaxes agree closely, star-for-star, with those based on the period-luminosity curve, which strengthens the case for the adoption of the latter.

NOVA SCORPII 1922.—This object was discovered at Arequipa by Miss Cannon. On July 1 it was invisible and less than magnitude 12·5. On July 11, 12, and 17 its magnitude was 10·5, 10·0, and 9·9 respectively, the latter being the maximum; on August 2 it had fallen to 10·2, and on August 21 (Harvard) to 11·4. The spectrum is of the Nova type; bright bands were probably absent on July 12, but certainly present on July 25. Search on plates made in former years shows no star as bright as magnitude 15 in the position.

Research Items.

THE CREEK INDIANS.—Mr. I. R. Swanton, in Bulletin 73 of the Bureau of American Ethnology, has followed up his study of the Indian Tribes of the Lower Mississippi valley (Bulletin 43) by an account of the Indians of the Creek Confederacy, about 9000 of whom were enumerated in 1910. This report does not deal with field work among the tribe, which is reserved for later publication, but is an attempt to gather from documentary sources an account of their movements from the earliest times until they are caught up into the stream of later history, in which concealment is practically impossible. It justifies the author's claim that it is an encyclopædia of information regarding the early history of the south-eastern Indians. A full bibliography and good maps will do much to assist the student of the ethnology of the American Indians.

THE STUDY OF FINGER-PRINTS: IDENTIFICATION OF COWS.—In the fourth number of *Dactylography*, a journal devoted to the study of finger-prints, Mr. C. L. Enos, superintendent of the State Bureau of Criminal Identification, Colorado, states as the result of his experiments that, as the human being can be identified by his finger-prints, it is reasonably certain that the pattern or design which Nature has provided at the end of every cow's nose may be made to serve the same purpose. Up to the present no precise classification has been worked out, and this will be necessary before such prints can serve a practical purpose. The noses of several calves have been printed each month for one year, and if further experiments show that these patterns persist during the life of the animal, it will supply a practical means of identification which will be valuable to all breeders and to the police.

THE MUSIC OF THE UTE INDIANS.—Miss Frances Densmore, well known by her previous studies of the music of the Chippewa and Teton Sioux tribes, contributes an account of that of the Ute tribe in Bulletin 75 of the publications of the Bureau of American Ethnology. This tribe, the origin of whose name is disputed, formerly occupied the entire central and western parts of Colorado and the eastern part of Utah, including the eastern part of Salt Lake valley and the Utah valley. The present work concerns only the Northern Utes, living in reservations in north-eastern Utah. They used to live in *tipis* covered with elk hides, but now log huts are extensively used in winter. They have never been a warlike tribe, but their tenacity of opinion has repeatedly brought them into contact with the Government; their characteristic is quick transition of mood concerning matters of secondary importance. The author gives a good account of their musical instruments, and has collected a number of songs—those of the Bear dance, Sun dance, Turkey dance, war songs, those used in the treatment of the sick and in connexion with games—which will interest both the student of music in the lower culture and the anthropologist.

JAPANESE PLIOCENE FOSSILS.—Some time ago we directed attention to a memoir by Prof. M. Yokoyama on fossils from the Lower Musashino Beds (Red Crag age) from the Miura Peninsula, Japan (NATURE, August 26, 1920, p. 836). To the same author we are now indebted for another valuable memoir (Journ. Coll. Sci. Tokyo, vol. 44, art. 1), this time on the Mollusca and Brachiopoda of the Upper Musashino Beds of Kazusa and Shimosa, to the east of Tokyo, that he considers to be of Upper Pliocene or even newer age, since the shell layer is near the top of the formation. There are 335 species described and a careful table of their distribution given, with notes as to their occurrence elsewhere, living or fossil. From this it is seen that six species are also found in our English Crags, one in the Pliocene of Italy, and several in North American Upper Tertiaries and Post-tertiaries. No less than 103 species are said not to be known living, while some 113 species are described as new, and, with many others, figured excellently on the seventeen appended plates. As in the case of the previous monograph, the nomenclature will not always pass muster with adherents to the international rules for zoological nomenclature.

FOSSIL VERTEBRATES IN CENTRAL ASIA.—More than twenty years ago a Russian geologist, W. Obrutschev, observed an extensive freshwater formation between Urga and Kalgan in Mongolia. He obtained from it the remains of a rhinoceros of middle or late Tertiary age. In the early part of this year, Messrs. R. C. Andrews and W. Granger, of the American Museum of Natural History, through the generosity of several friends of the Museum, were able to visit the same region and explore the formation more thoroughly. A preliminary report of their results is published by Prof. H. F. Osborn in the September number of *Asia*, the American magazine on the Orient. It now appears that the freshwater deposits represent a long period, and contain numerous fossil bones. The lowest horizon, apparently of Upper Cretaceous age, yields remains of dinosaurs closely related to those of the same age found in North America. They include iguanodonts, megalosaurians, and small running dinosaurs allied to Ornithomimus. Crocodiles and turtles are associated with them. The next horizon is evidently of Eocene age, and contains remains of hoofed mammals, some being small lophiodonts and others much resembling the peculiar titanotheres which are found in the Eocene of North America. In a still higher horizon there are large land tortoises, carnivorous mammals, and rhinoceroses, besides a gigantic rhinoceros-like mammal which may be related to the Baluchitherium discovered by Mr. Forster Cooper in Baluchistan. The collection which has been made will add greatly to our knowledge both of reptiles and mammals and of their geographical distribution. Geologists and palæontologists will await the detailed descriptions with interest.

ECOLOGY OF "FLOATING ISLANDS."—"Floating Islands," on which little colonies of vegetation maintain an independent, if precarious, existence, cut off from all connexion with the mainland, early attracted the attention of travellers, and have been reported from lakes, rivers, and the open sea. One of the earliest references is made by Herodotus to the floating islands of the Nile, and an interesting Japanese study by Harufusa Nakano (Journ. Coll. Sci. Tokyo, vol. 42, art. 3) quotes early Japanese and Chinese references, the earliest Chinese citation dating from about A.D. 300. Nakano shows that these floating islands may be found on inland waters in both the Northern and Southern islands of Japan. He traces their origin to various causes. Sometimes pieces are isolated from an indented coast-line by various factors active in erosion, as ice formation or frequent changes of water level; these pieces ultimately break adrift and float away. In other cases plant communities build themselves up from the shallow lake bottom and appear above water away from the land, ultimately losing their root anchorage and floating free; such islands are usually almost pure colonies of one species, as the islands of *Typha japonica* or *Zizania aquatica*. Another type of island consists mainly of one species of a free-floating plant, such as the islands of *Eichhornia crassipes*. A very interesting case is reported by Nakano from the shallow lakes found in high moorland regions. Here masses of peat, crowned with vegetation, may be raised from the bottom of the lake in large part by the gaseous products accumulated from decomposition processes, in part by the buoyancy of the tissues of the living plants; such islands may be recurrent, sinking and rising in different seasons. Floating islands are gradually leached of any humus or mineral nutriment they may originally possess, so that their base is ultimately mainly a tangle of roots and fibre. It is to this cause that Nakano traces the gradual disappearance of some of the colonists prominent on the newly formed islands, such as *Phragmites longivalvis*, not as Pallis has suggested for the "Plav" on the waters of the Danube (Journal of the Linnean Soc., vol 43, 1916) to the degeneration of a vegetatively propagated plant.

NEW MAPS OF THE GOLD COAST.—The Survey Department of the Gold Coast, which was closed during the war, was reopened in 1920 under Lieut.-Col. R. H. Rowe. Work has been pushed forward so rapidly that about 15,000 sq. miles have now been surveyed and the publication of the maps has begun. The sheets, which are printed by Messrs. W. and A. K. Johnston, are on a scale of 1 : 125,000. Relief is shown by brown form lines at an interval of 50 feet. Water features and names are in blue. Green is used for forests, and various symbols are employed to show the different kinds of plantations. Seven classes of roads and tracks are shown. Soundings in coastal waters are given in fathoms. The Accra sheet which has just been published is an excellent piece of work, and is notable both for its clarity and amount of detail. The same publishers have also produced a folding-map (scale 1 : 1,000,000) of the Gold Coast, Ashanti, Northern Territories, and British Togoland. No relief is shown. Colour is used for provincial and other boundaries, water features, and motor roads. This is a less striking map, but should prove useful for general reference purposes.

TROPICAL CYCLONES IN SOUTHERN HEMISPHERE.—A summary of tropical cyclones in the South Pacific, Australia, and the South Indian Ocean, by Dr. S. S. Visher, is given in the *U.S. Monthly Weather Review* for June. For the South Pacific 246 hurricanes are discussed. The huricane season extends from December to April, and during this period about 95 per cent. of the recorded storms have occurred; January alone has 30 per cent., while the six months from May to October make up only 4 per cent. of the total. A table gives the frequency of occurrence in the several island groups. A second table shows the number of hurricanes between the longitudes 160° E. and 140° W. for the several months and years, consecutively for the years 1830 to 1922. There is a further table which gives approximately the region of the origin of cyclones in the South Pacific, which shows a prevailing majority between 15° and 20° south latitude. Similar tables are given for recorded hurricanes, between 100° and 160° E., for Australia and adjacent waters. The maximum number of the approximate origins or places of first record occurs between 10° and 15° S. The main season for the Australian hurricanes is from December to April, and during this period about five-sixths of the storms occur. Storms are rare from May to November. Of the tropical storms in the South Indian Ocean, both January and February have 25 per cent. each and March 20 per cent. of the total. Storms are extremely rare from June to September. On the average rather more than a dozen tropical cyclones occur annually in longitudes 40° to 100° E. There is generally a preponderance of storms during recent years in the three regions, doubtless due to an increased number of observations. Representative tracks are well illustrated on two charts. The author states that many widely accepted generalisations as to tropical cyclones appear unsafe in the light of fuller data being gathered.

TREATMENT OF TIN AND TUNGSTEN ORES.—The Tin and Tungsten Research Board, under the chairmanship of Sir T. Kirke Rose, has recently given an account of the work done during the period January 1918 to December 1920, when its activities came to an end (Department of Scientific and Industrial Research. Report of the Tin and Tungsten Research Board. Pp. vi + 100. London: H.M. Stationery Office, 1922. 3*s*. 6*d*. net.). As a useful introduction to the papers dealing with the various investigations that have been carried out, an account is given by F. H. Michell of the methods already in use for dressing tin ore in Cornwall, and E. H. Davison gives a report on the microscopic examination of veinstones. The ore-dressing investigations include work on flocculation-effects and friability tests by S. J. Truscott and A. Yates, and an investigation by H. S. Hatfield of various physical properties in relation to concentration possibilities. Hatfield found that the osmose process was inapplicable to the separation of cassiterite. He also found that there is little prospect of increasing the yield on the dressing floors by the addition of flocculating agents to the pulp. His work on dielectric constants as a basis of separation is novel and interesting, depending as it does on a property which, like magnetic permeability, is characteristic of the whole mass of a mineral particle and not merely its surface, and is applicable to minerals generally. Other researches, by Sir T. Kirke Rose, J. H. Goodchild, and others, deal with chemical and metallurgical methods, including the use of solvents to remove cassiterite or wolfram by direct solution, the conversion of cassiterite or wolfram by furnace methods into a soluble product, followed by leaching, and the removal of the tin or wolfram from ores by volatilisation, followed by condensation. The report thus deals with many aspects of ore-treatment. It gives a large amount of information which will doubtless receive due attention by those interested in the Cornish tin-mining industry, and will presumably be put to the test so far as is practicable when the mines re-open.

SEPARATION OF ISOTOPES OF CHLORINE.—In the Memoirs of the College of Science of Kyoto Imperial University, vol. iv., No. 7 (March 1921), Dr. Ishino describes experiments with the crossed deflection positive ray method, in which a separation of chlorine into isotopes was obtained. The paper was received on July 22, 1920, and the work was completed in September 1919. Dr. Ishino made experiments to see if the separation of the parabolas (which are clearly shown in the plates) was due to impurities, and was able to show that this was not the case. He found the atomic weights of the two isotopes to be 34 and 36; a line, 37, was due to hydrochloric acid; the other hydride (35) had no corresponding line, but the broadening of the line 37 seems to show the existence of such a hydride. The connexion with the "whole number rule" and the helium nucleus is pointed out.

The Peril of Milk.

By Prof. HENRY E. ARMSTRONG.

A CONFERENCE of a most important and serious character was held in the Council Chamber of the Guildhall, London, on October 16-18, during the week of the Dairy Show, dealing with our milk supply in practically all its aspects—except the scientific! Yet we speak of science as salvation, perpetually proclaim its importance, and deplore public apathy towards its priesthood. Our class was not invited to participate. I heard of the conference only casually and bought myself in, only at the very last moment; consequently I was relegated to a place in the gallery behind the speaker's chair, where I could not hear a word. Being unobtrusive in my ways, I descended to the floor and trespassed into a vacant seat; the platform was all but empty but no invitation to take a chair upon it came down to me. I do not wish to complain but merely point out the rewards of scientific service and the effusive way in which the man of affairs welcomes our aid.

I make this statement, indeed, just to show where we are in public esteem, when subjects of vital importance to the national welfare, with which we alone can deal effectively, are under discussion—nowhere! Whose is the fault? Our own! We are mouldering away in our laboratories and when we seek to make known what we have been doing use a jargon which we cannot ourselves understand. That we have a public duty to perform seems never to occur to us. Much of our so-called research work is very largely wasted effort, without any real intelligence behind it —without policy and without imagination. The real problems are all but untouched.

Our knowledge of milk is practically nil—this was made clear at the conference. As the result of our careless abstention from the affairs of the world, sentiment and commercialism are quietly, without hindrance, wreaking their will upon the country. Few are aware, I think, of the extent to which milk is ceasing to be milk as the cow gives it: how it is being tampered with to overcome initial avoidable carelessness, to make it keep and to satisfy the undiscriminating animus against micro-organisms engineered into existence, of late years, by bacteriologists. Apart from the wonderful livestock, *the* feature of the Dairy Show was *Pasteurising* plant. One of the most interesting of these is to be operated at 135° C.!

I was the first to take the floor after the opening paper was read, dealing with breed of cattle in relation to quantity, composition and cost of milk production. I deplored the absence of the chemist and insisted that we know nothing of the composition of milk in any proper sense of the term—that to talk of it in terms of fat and solids-not-fat was equivalent to describing a house in terms of percentages of bricks, mortar, wood, etc. Modern discovery had taught us that the essential value of milk lay in certain mysterious minor constituents which could neither be identified nor quantified—yet were of most vital consequence: which I would term *advitants*—to catch the public ear, maybe *vitalites* were better—but refuse to misname vitamins.

To justify Pasteurisation, we have to show that no harm is done to milk by heating it above bloodheat. To heat it above this temperature is to treat it *unnaturally*—this cannot be gainsaid. That it is altered thereby is proved up to the hilt. The contention is that, by making a certain addition, we can compensate for the alteration—but we have only superficial evidence in favour of this contention. The medical profession has only recently had its attention directed to these matters—it does not know yet what to look for. The effects may be deep-seated, we know; and they may come but slowly under notice. Time alone, combined with the most refined study of the problem, can prove that it is safe to trespass beyond Nature's limit. The second teeth, we know, are formed at birth; scurvy affects their structure ere change be noticeable externally; and so it may be in other cases. The bad teeth of our nation are probably, at least in large part, due to defective nutrition in early years and they affect us throughout life. Nations whose children are all breast-fed have good teeth.

The only rational assumption to make is that no constituent of milk is without a purpose and that, if anything in it be destroyed, it loses in dietetic value. The recent remarkable discovery, that a something secreted by the pancreas, no gross constituent apparently, is required for the normal metabolism of so combustible an article of diet as sugar, should be a warning against destroying any natural agent in a whole food like milk; especially in view of recent work by Gowland Hopkins.

At a time when we are beginning to know these things, we have no right to develop an unnatural practice and allow it to become general. We must gain much more knowledge before making up our minds. On all sides, at the conference, it was recognised that clean raw milk can be produced and purveyed, if we will but take a little care.

Scurvy, rickets, beriberi, we know, are diseases affecting us as consequences of malnutrition; scurvy became rife in Denmark early in the war, on the farms, when the children were fed on Pasteurised milk. Who shall say that a host of our minor complaints are not due to dietetic deficiencies? Women are often most faddy feeders and the frequent appearance of nervous disorders in their sex may well be connected with lack of vital elements, even due to seed sown in infancy. We may be laying the foundation of complaints worse than cancer.

Who knows or does not know? At present we can *assert* nothing, either way, so crass is our ignorance: so let us halt while we may.

The effect of food on the cow's milk was more than once brought out at the meetings. We were told that milk from cows that had been stall-fed but grazed occasionally proved vastly richer in one of the advitants than that from animals simply stall-fed; also that two varieties of one root crop had different effects on the production of milk. Pigs apparently give healthy pork when grass-fed but not when starved of green food. The whole field of food inquiry lies open before us. Prof. Stenhouse Williams—dairy bacteriologist at Reading College—and I were the only speakers to sound the note of nutritional danger from Pasteurisation. We stood alone. Rothamsted, which claims to stand at the head of agricultural research, was unheard; the Animal Nutrition station at Cambridge was voiceless. Sir W. Morley Fletcher, of the Medical Research Council, who took the chair at the discussion on Pasteurisation, had not a word to say by way of caution. The Medical Research Council, however, has never had a chemist among its members; and yet medicine is nothing but applied chemistry.

Where, we may ask, are the Prophets? Science is simply disgracing itself in this matter of milk: the call to wake up and defend the public health must go out everywhere.

Indian Institute of Science, Bangalore.

Although only 203 students have worked for various periods in the laboratories of the Indian Institute of Science at Bangalore since its opening in 1911, and although only 14 of these have been regarded by the council as suitable for the diploma of associateship, the history of the Institute is of special interest to students of educational methods. The conditions affecting the activities of the Institute depart, however, so widely from the normal that it is impossible at this stage in its history to be sure whether any, and what, changes in the administration of the Institute would have resulted in more visible success. Bangalore, the site selected for the Institute by the late Sir William Ramsay, is mainly a military cantonment. Its position as a centre, either of scientific education or of technical industries, is almost negligible. The Institute itself occupies isolated ground far enough from the town to cut it off largely even from the limited social amenities obtainable in an Indian cantonment station. Distances in India are of the continental order, and university graduates, being generally married in early life, hesitate naturally to leave the established university cities to undertake post-graduate training at a distant institute which has no traditions, no connexions, and no established market value. Moreover, the number of science graduates qualified in India to undertake research work has hitherto been very small.

The machinery of government originally designed for the Institute reproduced some of the ordinary features of established universities, including a large "court," composed of widely dispersed members who have never even met as a body. Even the relatively small council is handicapped by the distance of some of its members, and its meetings have thus been largely controlled by the resident professorial members. Influenced by desire for a special review of progress by an entirely independent expert body, the standing Committee of the Court in 1921 requested the Governor-General in Council to appoint a committee of inquiry, which met towards the end of the year under the chairmanship of Sir William Pope, professor of chemistry at Cambridge; and the report of the committee recently made available forms a valuable study of this artificially created institution.

Hitherto the work of the Institute has been limited to two groups, which are distinct from one another in nature and method of training. In the department of pure and applied chemistry, students have been engaged in research problems; there has been, however, no systematic course of training, either by lectures or laboratory work. In the department of electrical technology, on the other hand, students have undergone a more systematic training, with the view of qualifying as practical electrical engineers. There has been no department of physics to link the other two, and no department of mechanical engineering on which to base the training in electrical technology.

Up to 1918 the annual income of the Institute amounted to something less than 17,000*l.*, but recently, owing to the sale on advantageous terms of the investments left by the founder, the late Mr. J. N. Tata, the income now available is nearly doubled.

The committee, in accepting the conclusion that the Institute has not fulfilled the just expectations of its founder, wisely refuses to discuss the merits of the specific complaints made against its administration, and limits its report to the discussion of proposals for reform. In the first place, the committee, after briefly reviewing the standard of scientific training obtainable at Indian institutions of university rank, considers it desirable to establish, by lectures and laboratory practice in the Institute itself, definite courses of instruction which will lead the ordinary science graduate from the stage at which he usually leaves the average university college to that which will qualify him for systematic research.

Having given an outline of the fundamental policy to be kept in view, the committee proceeds to discuss plans for the logical expansion of the departments already established, assuming this to be preferable to the immediate introduction of additional branches of science. The scheme outlined contemplates the institution of eight professorships in branches of pure and applied chemistry, and these are to be linked with the now isolated department of electrical technology by a chair in general physics. It is proposed also to establish two additional chairs, namely, one in applied mechanics and another in thermodynamics, for the purpose of rendering more effective the training in the department of electrical technology. For the time being this scheme goes as far as it is safe to project future developments; even this will require a larger income than is now in sight. Indeed, two new chairs will practically absorb the present annual surplus, and the committee thus recommends that the first two chairs established to supplement existing activities should be preferably in chemistry and in thermodynamics and heat engines.

To create in other parts of India an extended interest in the Institute, the committee recommends a reconstitution of its government machinery. To the court it is proposed to add representatives of any new benefactors that may appear, as well as representatives of all the "reformed" Governor provinces, except Assam.[1] The committee proposes also to introduce a representative of each of the new legislative councils, Assam not in this respect being specifically excepted. These changes, the committee hopes, will create a friendly interest in the Institute in other parts of India; but the tendency (always manifest, and now decidedly strengthened by the recently reformed constitution) of developing provincial institutions may neutralise to some extent the committee's expectations in this respect. The only alternative plan of dispensing with such large controlling bodies introduces, however, dangers of the kind that, according to some witnesses, have adversely affected the development of the Institute hitherto.

The council now proposed as the body responsible for the determination of matters of policy, for finance, and for the appointment of a staff, includes the executive head of the Institute, who is styled principal in preference to director, together with eleven other members, composed of five nominees of the Indian universities, two of the Tata family, two of the Mysore State, one of the Indian Legislative Assembly, and a scientific officer to represent the Government of India. An explanatory paragraph in the report assumes that by this scheme the central government will be represented by two nominees, but the nominee of the Indian Legislative Assembly would be in no sense a representative of the Government of India.

For purely academic business it is proposed to establish a board of studies, composed of the principal, the professors, and certain other members of the staff.

The committee recommends that the principal should be a scientific man of eminence, with proved administrative capacity. This obviously wise prescription has been observed in the recent appointment

[1] We understand that the Government of India proposes to add to the government machinery of the Institute a representative of Assam and another of the newly constituted University of Delhi.

of Dr. M. O. Forster, although apparently it has not been found possible to combine these two qualities with "considerable Indian experience," which the committee regards as "almost essential."

Among the many difficult questions which the committee has carefully considered are: (1) The claims of local administrations on the services of the professorial staff for special investigations outside the Institute. Admitting the occurrence of exceptionally urgent instances, the committee thinks that any tendency in this direction to take members of the staff away from their immediate duties inside the Institute should be resisted. (2) The investigation of special technical problems for outside persons. These, the committee thinks, might be permitted under suitable control at the expense of the applicants, so long as a fee be also charged and be wholly credited to the Institute funds, no part of the fees thus obtained being granted to the salaried members of the staff who may undertake the work. (3) The committee considers that the higher staff should not accept any private practice which involves work to be carried out in the Institute laboratories, although it might be permissible for a professor to undertake purely consulting practice, subject to the approval of the council and with specified limitations. (4) While a member of the staff should enjoy the copyright benefits of any book of which he is the author, the committee is less decided about his taking out patent rights for inventions arising out of work done at the Institute. Each specific case of the sort which arises should be dealt with by the council on its merits. (5) Technical investigations in the Institute which successfully lead to work on a factory scale (when, naturally, commercial interests intervene) should be stopped at this stage. In the opinion of the committee, the work should then be transferred to a commercial firm, which might, if necessary, employ members of the staff in a purely consultative capacity. (6) The Institute should not undertake routine analyses and determinations; these should be left to the private enterprise of outside chemical firms.

The committee thinks that the necessary co-ordination of the work of the Institute with that of Indian universities will be in part effected by the university representatives on the council and by more efficient publication of information regarding the activities of the Institute itself. It is suggested that the Journal of the Institute should be expanded to be made of more general interest; that the local organisation of an Indian section of the Society of Chemical Industry should be undertaken; that the staff should be encouraged, by the grant of travelling expenses, to take part in the annual meetings of the Indian Science Congress; and that a report on the research programmes in progress at the Institute should be submitted annually to the Indian Board of Scientific Advice.

Because of the isolated location of the Institute, the committee recommends an improvement in the hostel accommodation, especially for the benefit of married students, and generally an increase in the facilities for games and other social amenities. To ensure that progress is effected on sound lines, it is recommended that the Governor-General in Council as visitor should institute, once in every quinquennium, a review of the operations of the Institute by a special committee of inquiry.

Psycho-Analysis and Education.

THE place of psycho-analysis in schools was the subject of a discussion at a joint meeting of Sections of Psychology and Education of the British Association meeting in Hull. The crowded meeting testified to the evident interest taken in the subject, and to the growing appreciation of the need in educational work of a closer co-operation between those who are responsible for the training of the young, and those who are making a scientific study of mind working and development.

It will be well at the outset to state that the term psycho-analysis was used by all speakers in the broad sense of mental exploration to discover, or at least trace, the mental history of the abnormal child, the cause of his mal-development, feeble intelligence, delinquency, or vicious conduct. In no case was the term used in the strict Freudian sense; in fact, Dr. Crichton Miller, one of the speakers, expressly stated that, in order to avoid any misconception arising from the use of a term that might imply exclusively the theory and technique laid down by Prof. Freud, he preferred to use the term analytical psychology.

Appearing first as a method of treating nervous disorders Dr. Miller said that analytical psychology has a wider function. Its real scope and value should be preventive, its application as universal as the accepted principles of hygiene, and its propaganda carried on by all who have a stake in the next generation. Hence its importance to teachers, and hence the necessity for teachers to understand and value it in their own experience.

The advent of analytical psychology marks a new era in education because it makes a new demand, that the teacher should know, not only his subject and his pupil, but himself. It follows that one of the chief functions of analytical psychology in education is not to enable the teacher to analyse his pupils—a technical task for which he cannot usually have either the time or the training—but to help the teacher to recognise and remedy failures of character development in himself, the inherent childishness, the prejudice, and self-deception which are the chief obstacles to understanding children, and handling them wisely. If there are still teachers who maintain that analytical psychology is irrelevant to their work, Dr. Miller reminded them that their failures will come to be judged by analysts later who have to attempt the re-education of the adult who might have developed into a man, and instead developed into a neurotic.

Dr. C. W. Kimmins in opening the discussion presented the case from the schools point of view, and claimed that the time was singularly opportune for a clear statement by the experts of the possibilities, and limitations, of the part a well-qualified psychologist could take in the appraisement of intellectual values, and in helping to solve those complex problems presented by the abnormal child.

The improvement attending the use of intelligence tests in the selection of children for promotion over the method of marks gained by the usual examination method has already been demonstrated, and there is no doubt that in the greater freedom of the child, and the fuller scope it has of self-expression and self-development under the Montessori system, the Dalton plan, or any other similar form of school organisation, many of the so-called psycho-pathological cases would disappear. But the child that will not respond to normal methods of instruction or treatment will probably always exist. The boy who has no apparent mental or physical defect, is interested in out-of-door life and plays games but shows no interest in instruction, and is always at the bottom of the class, is an educational failure, and a case for the psychologist. A day-dreamer is another type.

These Dr. Kimmins would have treated at psychological clinics such as are already established in the United States, America, and other countries, in which very useful results have been obtained. He also suggested that if the teacher had a fairly sound knowledge of his own personal equation it would greatly increase his efficiency.

Dr. Hamilton Pearson claimed that the practical application of psycho-analysis had a place in school routine with two reservations, namely, that the operator should be not only a trained analyst, but should have special experience in child analysis, since the technique is different, and the work altogether more difficult and delicate than with adults; and secondly, that the limitations of the field of application within the radius of our present knowledge are thoroughly understood. In helping to define those limitations it may be taken as a rule that no child showing normal development, adapting adequately and progressively to its environment, should have even a nodding acquaintance with analysts. The rigidity of a systematised educational scheme must of necessity fail to win response from a minority of children, and this coupled with an adverse family environment accounts for the mal-development of the few. Among this group of potential neurotics, criminals, and chronic failures lies the sphere of usefulness of the child analyst.

Dr. Pearson declared that analysis itself is not curative, but by exposing the causal factors of the mal-development it is a means of pointing the way to constructive methods of treatment. He described three cases in which analytical methods had been used, to illustrate how they had been treated. The subsequent history of each child showed how by co-operation with the teacher a definite cure had followed. He believed that in co-operation lies the future of psycho-analysis in its practical value to school life, and that the knowledge gained in dealing with the abnormal would be of inestimable importance in dealing with, and understanding, the normal.

Dr. R. G. Gordon endorsed the value of co-operation of the workers in the fields of education and psychology, and also emphasised the necessity that such problems should be dealt with only by people whose knowledge is extensive, and embraces such collateral subjects as physiology and biology. He protested strongly against the unqualified dabbler with his pseudo-metaphysical speculations which are not even logical.

Dr. Gordon described two types of children likely to give trouble, namely, the psycho-pathic child, and the retarded child who is yet not sufficiently feeble-minded to be classed as mentally deficient. Every child inherits certain predispositions, and some dispositions unmodified or uncontrolled are evil and lead to vicious conduct, but if properly correlated, and modified by each other, and by education, they are all capable of leading to the highest virtues. It is the uncontrolled impulses which characterise the behaviour of the moral deficient, such as an overmastering impulse of acquisitiveness and a complete failure to get into touch with reality.

The retarded child is a slightly different problem. If with an intellectual inferiority he possesses a nature in which self-assertion is a large factor, he will not submit to inferiority—superiority at games may save his self-respect, but in their absence his will to assertion may show itself in acts of rudeness, disobedience, or stubbornness. To avoid punishment he becomes a liar; to prove his independence he plays truant; and possibly to further his object he may steal money, etc. Other undesirable traits may exhibit themselves in his efforts to gain ascendancy over other children. In many cases it is only necessary to remove such children from the unfair competition involved in school, and start them in training suited to their intellectual capabilities. Not only will this do away with all vicious tendencies, but it will increase their achievement to a remarkable degree, so that they grow up not incapable of taking a worthy place in the world. Neglect of proper treatment for such children means that they eventually enter the ranks of the neurotic or the criminal, or may turn to drink or drugs which lead to an abased and useless life. It is obvious that investigation and treatment of such cases should be definitely undertaken both for the sake of the individual and of the State.

The investigation should be carried out in three directions: (1) the physical examination—a purely medical concern; (2) the intelligence estimate through the use of such means as the Stamford revision of the Binet-Simon tests, etc.; and (3) the child's reaction to life—requiring mental exploration. In the last case Dr. Gordon said if clinics are established it must be borne in mind that only properly qualified workers should conduct the inquiry. The mind of the child is a delicately adjusted mechanism and cannot be too carefully handled; the greatest care must be taken that nothing shall be implanted which shall still further weaken control and upset the nice adjustment of impulses on which his or her sanity depends. The functions of such clinics will at first be purely advisory, and here the importance of sound advice is obvious.

In schools of all types are to be found children whose moral sense and will to work are so impaired that their time at school and probably at home is a succession of misdemeanours and acts of viciousness, a continued refusal to adapt themselves to social order; they are deaf to all appeals to reason. The investigation of the problems set by these children seems to be rightly in the hands of the psychologist, and the present inquiry is to learn to what extent mental exploration in the form of psycho-analysis can save the child by pointing out the cause and thus suggesting the remedy. Every speaker expressed the opinion that this inquiry should only be undertaken by a fully qualified specialist and should be limited to those children who were abnormal in their behaviour and in their response to the usual incentives to work.

Corrosion and Colloids.[1]

CORROSION is defined as the oxidation of a substance; it may be produced by chemical or electro-chemical means. The following facts are difficult to explain on a purely electro-chemical theory of corrosion: (*a*) Certain depolarisers do not increase corrosion, but actually inhibit it; (*b*) the conductivity of electrolytes is not directly connected with the amount of corrosion; (*c*) Lambert's pure iron is readily attacked by sodium chloride solution and dilute acids; and (*d*) the presence of ions of the corroding metal sometimes increases corrosion. The order of corrodibility of metals in distilled water, certain salt solutions, and non-electrolytes is different from their order in the electro-chemical list; this suggests that there are factors interfering with the electro-chemical action. Such factors are scale formation, and the nature and distribution of the products of corrosion.

The effects of strain and impurity in the metal are considered on the electro-chemical view to be of fundamental importance. Experiments on Lambert's

[1] Abstract of sixth report of the Corrosion Research Committee of the Institute of Metals, presented by Dr. G. D. Bengough and J. M. Stuart at the Swansea meeting of the Institute on September 20.

pure iron and lead showed that the effect of strain is a minor and ephemeral factor in corrosion in neutral solutions; a trace of impurity appears to assist local corrosion, but the amount of corrosion is not proportional to the amount of impurity. The effect of a trace of impurity is probably a trigger action. The main function of oxygen in corrosion is not that of a depolariser, but rather to oxidise the metal directly, and also in some cases the products of corrosion.

Two chief types of corrosion are distinguished: (*a*) The general type, usually characteristic of acid corrosion; and (*b*) the local type, usually characteristic of corrosion in water and salt solutions. The latter is generally characterised by the formation of an adherent scale on the metal, which may contain colloid. The significance of colloids in corrosion appears to be as follows: A metal immersed in water sends positively charged metal ions into the liquid, and becomes itself negatively charged. With commercial metals, the metal also becomes superficially oxidised if dissolved oxygen is present. The hydroxide produced can take up the ions given off by the metal, and thereby becomes a positively charged colloid. Some of this will diffuse away, permitting further reaction between oxygen and the metal surface. Oxidation stops until this hydroxide can pass into the colloidal state by acquiring positively charged metal ions. This, in general, does not take place till the colloid initially formed has diffused into the presence of electrolyte, when it is precipitated by the anion of the dissolved salt, the cation neutralising the charge on the metal corresponding to that on the colloid. Then the metal can send more ions into solution, and the uncharged hydroxide can acquire a charge. If the colloid produced can diffuse away, the process can continue and corrosion develop. If the colloid precipitates directly on the corroding surface it will, in general, adhere and stop corrosion. In the case of a corrosion pit, it is only when the colloid diffuses through an aperture in the gel-deposits at the mouth of the pit that it meets electrolyte and is then precipitated. Such precipitation merely thickens the external gel-deposits. The latter protect the metal surrounding the pit, and emphasise the local nature of the corrosion.

Vitamins.

THE Sections of Physiology and Agriculture of the British Association held a joint discussion on vitamins at Hull on Friday, September 8.

Prof. J. C. Drummond spoke of the great strides that have been made since the discovery of the vitamins by Hopkins in 1912. Both the existence and the indispensability of these substances are now generally accepted. The far-reaching importance of the qualitative composition of the diet of man and animals is being gradually appreciated, and the significance of those factors which exist in extremely minute amounts recognised. Three substances of the so-called vitamin class have been differentiated with certainty, and it is possible that more exist. They do not appear to be of one chemical type, and the only ground for grouping them together is that they occur, and are effective, in very small amounts. Parallel examples from the inorganic food constituents are known, such as the value of minute doses of iodides in the treatment and prevention of fœtal athyrosis in swine.

The green tissues of plants would seem to be the chief site of vitamin synthesis, although lower forms of plant life devoid of photocatalytic pigments can apparently produce the vitamin B. Plant tissues undoubtedly form the direct or indirect source of the vitamin supply of animals, but we are entirely ignorant as to the rôle of the vitamins in the plant itself.

Storage of the vitamin A may take place in the tissues, liver, and body fat of animals, and may serve as a reserve from which are drawn supplies to maintain the vitamin concentration of milk if the diet during the lactation period should be deficient.

In collaboration with Dr. Zilva a prolonged investigation of the origin of the large stores of vitamin A in cod-liver oils has recently been made. It has been ascertained that the marine diatoms synthesise the vitamin, and that it is transferred to the tissues of minute animals (plankton) which thrive on the unicellular plants. These in turn form the food supply of larger species, particularly small fish, which in their turn are devoured by the larger fish, such as the cod. Through all these stages there is apparently a transference of the vitamin, ending finally in the storage in the liver of the cod. The modern methods of manufacture of cod-liver oil do not appreciably lower the vitamin value, but there are wide variations in the value of different samples which are probably connected with the seasonal changes in the feeding habits or physiological condition of the fish. Considerable work has been done on the chemical nature of the vitamin A, but an isolation has not yet been made. It is very stable, except to oxidative changes, and passes into the unsaponifiable fraction of the oil. Cholesterol, pigments, and other fractions of this fraction may be removed without loss of potency.

Capt. J. Golding gave a number of illustrations of the value of the application of vitamin theories in practical pig-feeding. Frequently the usual type of pig diet is deficient in vitamins, particularly vitamin A, and the beneficial influence of cod-liver oil or of feeding on pasture or lucerne in such cases is remarkable. In the compounding of rations care should be taken to ensure an adequate supply of food-stuffs rich in vitamins, otherwise there is danger of subnormal growth, impaired resistance to infections, and disturbances of the power to produce and rear normal young. The majority of the cereal products are deficient in vitamin A, and the amount in the diet is not raised much by the use of separated milk. Such diets can be supplemented by small additions of cod-liver oil, 1-2 oz. daily for full-grown pigs, or by access to pasture. Cod-liver oil is also valuable in maintaining the vitamin value of the milk yielded by cows on winter rations in stall, which otherwise tends to fall. The administration of cod-liver oil, if of good quality, does not produce flavour or taint in pigs or milk and butter.

Dr. Atherton Seidell (New York) described his attempts at the separation of the vitamin B from yeast by chemical methods. By adsorption of the vitamin from yeast extracts on to fuller's earth, and extraction of the activated solid with alkalies under suitable conditions, considerable concentration of the active substance could be effected. The resulting extract when fractionated by precipitation with silver salts gave active fractions, but these have not yet yielded a pure substance.

Prof. W. D. Halliburton referred to the need for caution that enthusiasm for a new word such as vitamin did not overwhelm the importance of other dietary units. There must not be a loss of perspective in viewing the function of these newly discovered substances. There is also need for further research on the nature of the substances (auximones) which are believed to act as vitamins for plant growth.

Dr. Monkton Copeman agreed with the importance of vitamins for the young and growing organism, but questioned whether they are as important, or not actually deleterious, to the mature animal. In some researches which had recently been made under the auspices of the Ministry of Health, evidence had been obtained that patients suffering from malignant growths had received benefit from a course of feeding on dietaries deficient in vitamins. There was also a definite, if microscopic, fall in the Registrar-General's figures for cancer during the years of the war, when food restrictions were in force.

British and American Fine Chemicals.

THE "Catalogue of Chemical Products" issued by the British Drug Houses, Ltd., is now so well known to chemists that there is little need to do more than direct attention to the new edition, issued on September 21, which includes several thousand chemicals, many of them recent additions. The firm caters not only for chemical laboratories, but also supplies an extensive range of requisites for microscopic work, such as stains, mounting media, embedding materials, liquids of known refractive index, etc. Special mention may be made of the list of about 50 indicators for which the catalogue gives a useful table showing the PH range in each case, including the universal indicator, a mixture to be used for determining rapidly and in one operation the approximate PH of a solution by the colour developed.

A new edition (No. 8) of the list of organic chemicals sold by the Eastman Kodak Co. in the United States has also been issued recently. It includes about 1400 products and has two good features which British firms might copy with advantage. It indicates, usually by means of the melting- or boiling-point, the degree of purity of the product, and states which materials have been made or purified in the firm's own laboratories. The American firm seems to realise the necessity of securing as quickly as possible a reputation for quality similar to that enjoyed by a few of the German makers before the war, and the features just alluded to have no doubt been introduced into their list with that object.

The Eastman list begins with an introduction in which, after recording progress, a frank appeal is made to chemists to co-operate with the company in making the United States independent as regards the supply of these essential materials, by indicating possible means of improving the quality, furnishing information as to supplies of new or rare organic chemicals available for purchase, and suggesting new materials for manufacture.

British manufacturers should realise that British chemists are equally interested in this matter so far as this country is concerned, and similar appeals in their lists would probably have an excellent effect. There are few research laboratories in which there are not residues of rare organic chemicals available for disposal, and most laboratories of university standing could, from time to time, do something towards supplying complex organic chemicals.

It has been urged against the Board of Trade lists drawn up under the Safeguarding of Industries Act that they "protect" many chemicals which, owing to the small demand and the cost of labour, can never be made in this country. The co-operation of university laboratories might also be a means of overcoming this difficulty.

University and Educational Intelligence.

CAMBRIDGE.—Mr. E. C. Francis, Trinity College, has been elected Fellow and mathematical lecturer at Peterhouse. Mr. C. G. Lamb has been appointed reader in electrical engineering.

The allotment made in 1920 of 165,000*l.* for the endowment of the School of Biochemistry from the estate of the late Sir William Dunn has been increased by a further sum of 45,000*l.* It is of interest to note the allotment ordered by the Court for the subdivision of the total sum of 210,000*l.*, namely (*a*) 96,000*l.* for the site and building of the Institute of Biochemistry; (*b*) 18,000*l.* for equipment, maintenance, and improvements out of annual income; (*c*) 89,000*l.* for salaries and the expenses of research work out of annual income; (*d*) 7000*l.* for a fund to meet contingencies and unforeseen expenditure.

A studentship for study and research in the languages, literature, history, archæology or art of ancient Greece or Rome or the comparative philology of the Indo-European languages is to be founded from a bequest under the will of the late Sir John Sandys, Public Orator.

MANCHESTER.—On Monday, October 30, Mr. Harold L. Cohen opened the Lewis Departmental Library in the Faculty of Commerce and Administration. This library, and also certain scholarships, have been provided from a gift by Messrs. Lewis with the object of encouraging co-operation between the university and the business community of the city. The Faculty of Commerce has made rapid progress during recent years, and it is hoped that university graduates may find increasing opportunities to demonstrate the value of a university training in commerce.

Mr. E. J. Sidebotham has been appointed honorary lecturer in public health, and Mr. G. J. Langley hon. assistant lecturer in physiology.

The following appointments have also been made: assistant lecturer in electrical engineering, Mr. L. S. Palmer; special lecturer in textile design, Mr. Henry Cadness; Osborne Reynolds fellow, Mr. F. D. Reynolds; Vulcan fellow, Mr. F. Heywood; Leech fellow, Mr. C. D. Hough.

ST. ANDREWS.—The University Court has now made an appointment to the chair of natural philosophy in the United College, which became vacant at the end of last academical year by the retirement of Prof. Butler. The new professor is Dr. H. Stanley Allen, of the University of Edinburgh. Dr. Allen was educated at Kingswood School, Bath, and Trinity College, Cambridge. Afterwards he held a post as assistant lecturer at the University College of Wales, Aberystwyth; he also did research work in physics at the Cavendish Laboratory, Cambridge, under the direction of Sir J. J. Thomson, and was in charge of Lord Blythswood's physical laboratory at Renfrew. In October 1905 Dr. Allen was appointed to a post in the physics department of King's College, London, where, after being lecturer for some years, he followed his chief there (Prof. C. G. Barkla) to the physics department in Edinburgh. In the course of his career Dr. Allen has had a varied experience of the teaching of physics, and he has made some notable contributions to the scientific literature of the subject.

THE following Parliamentary candidates for university constituencies have been returned unopposed:—Scotland: D. M'Coig Cowan (N.L.), Sir Henry Craik (U.), and Sir George Berry (U.). Queen's, Belfast: Sir William Whitla (U.). Sir George Berry is the only new member from these two constituencies.

Calendar of Industrial Pioneers.

November 12, 1902. William Henry Barlow died.—Appointed principal engineer of the Midland Railway in 1844, when thirty-two years of age, Barlow laid out the line from London to Bedford and was responsible for St. Pancras Station. He was also concerned with the Clifton Suspension Bridge, the second Tay Bridge, and the Forth Bridge. He was widely known for his scientific investigations of arches and beams, and in 1868 was made one of the committee appointed to investigate the applicability of steel to structures. He was a vice-president of the Royal Society, and in 1879–80 president of the Institution of Civil Engineers.

November 13, 1903. Josiah Vavasseur died.—One of the chief ordnance engineers of last century, Vavasseur invented in 1866 the copper rotating ring or band for projectiles of breech-loading guns, and subsequently did important work on the construction of built-up steel guns and on hydraulic mountings. In the Vavasseur mounting of 1877, the recoil was for the first time scientifically controlled by hydraulic buffers having a uniform resistance. The London Ordnance Works which he founded was in 1883 merged in those of Armstrong's at Elswick.

November 14, 1830. Henry Bell died.—The foremost pioneer of the steamboat in Europe, Bell, who was born at Torphichen, Linlithgowshire, on April 7, 1767, was apprenticed as a stone mason but afterwards became a shipwright and builder. In 1808 he became proprietor of a hotel and baths at Helensburgh on the Clyde and in 1811 ordered the *Comet.* In August 1812 this little craft began running between Glasgow and Greenock, and from this dates the beginning of steam navigation in Europe. The vessel was wrecked in 1820, but the engine was salved and is preserved in the Science Museum at South Kensington.

November 14, 1905. Robert Whitehead died.—The inventor of the automobile torpedo, Whitehead made his first torpedo in 1866 while holding a position in an engineering works at Fiume. Taken up first in 1868 by the Austrian Navy, experiments were carried out at Sheerness in 1870 and soon afterwards the torpedo was adopted by the British and other Governments.

November 15, 1839. William Murdock died.—Known principally for his discovery of lighting by coal gas and as the originator of a great industry, which in Great Britain alone consumes some 22,000,000 tons of coal per annum, Murdock was for many years the right-hand man of Boulton and Watt. He was first employed by them in 1777, and was sent to Cornwall to erect steam engines. In his house at Redruth in 1784 he experimented with a small locomotive and in 1792 lighted his house by gas. He was also a pioneer in the transmission of power by compressed air.

November 16, 1911. Engelbert Arnold died.—A notable contributor to the literature of electrical engineering, Arnold, after studying at Zürich, engaged in practical work in Russia. For a short time he was engineer to the Oerlikon works in Switzerland and from 1894 to 1911 held a chair at the Institute of Technology at Karlsruhe.

November 18, 1814. William Jessop died.—Trained as a civil engineer under Smeaton, Jessop was employed on some of the English canals, completed the West India Docks and constructed a railway in Surrey which was the first opened to the public in the South of England. E. C. S.

Societies and Academies.

LONDON.

Royal Society, November 2.—Sir Charles Sherrington, president, in the chair.—Lord **Rayleigh**: Polarisation of the light scattered by mercury vapour near the resonance periodicity. White light scattered at right angles by dense mercury vapour is to a first approximation completely polarised. Ultra-violet radiation of the mercury spectrum line λ2536, when examined immediately it enters mercury vapour in an exhausted vessel at room temperature, gives a scattered radiation which is slightly though definitely polarised. This polarisation has been observed to increase as the beam is filtered by penetration of a considerable depth of vapour. After penetration of 27·5 cm. of vapour the weaker polarised image had 60 per cent. only of the intensity of the stronger one, instead of 90 per cent. as at first. The radiation removed by the filtration appears to lie within a spectral range of about 1/100 Ångstrom.—G. P. **Thomson**: The scattering of hydrogen positive rays and the existence of a powerful field of force in the hydrogen molecule. At a pressure of less than 1/100 mm., hydrogen positive rays of 10,000 volts mean energy suffer considerable small-angle scattering in a distance of 15 cm. This scattering is 10-20 times greater than would be expected on theoretical grounds. There must, therefore, be a field of force in the hydrogen molecule at distances of the order of 10^{-8} from a nucleus which is much stronger than would be expected from the inverse square law. A subsidiary experiment throws great doubt on Glimme and Koenigsberger's "Stossstrahlen."—H. D. **Smyth**: A new method for studying ionizing potentials. Positive ray analysis is used to study the ions produced in a gas or vapour by the impact of slow-speed electrons of known energy. This requires that the density of gas be considerable where the energy of the impacting electrons is known, and as small as possible where the energy conditions are not known. In the case of mercury such a localisation of vapour density was obtained by using a unidirectional molecular stream similar to that employed in a mercury diffusion pump. Ions were produced by electrons from a hot filament, and after acceleration by a large electric field were analysed by a magnetic field. In this way the values of m/e were determined approximately. The experiments on mercury indicate the formation of doubly charged ions at 19 ± 2 volts. The series relations of the enhanced spectrum of mercury are not known, but analogy with zinc and cadmium suggests an estimate in agreement with the above value. The conclusion is that the double ions formed at this voltage are the result of two impacts. Experiments at higher voltages indicate formation by single impacts. More highly charged ions were present in such small quantities as to make their identification uncertain even at voltages as high as five hundred. It was also impossible to identify a singly charged diatomic molecule.—I. **Backhurst**: Variation of the intensity of reflected X-radiation with the temperature of the crystal. General agreement only is found with the theories of C. G. Darwin and P. Debye. Aluminium: Very marked decrease in intensity was observed with rise of temperature, and fair agreement with P. Debye's theory obtained for the (100) and (222) spectra. Carborundum: A special furnace was constructed for temperatures up to 960° C. and no deterioration of the crystal was observed. The decrease in intensity with rise of temperature was much greater for the higher-order spectra, and different curves were obtained for the K α (333) and K β (333) spectra. Graphite: Only for the cleavage-plane reflection was it possible to obtain a definite temperature-intensity curve, and for the direction perpendicular to this plane an unusually high coefficient of expansion was measured. Diamond: No decrease in intensity was found that could be measured with certainty, and a very small thermal agitation would be expected on account of the diamond structure's great strength. Ruby and sapphire: An anomalous effect was observed, since the decrease of intensity of the (111) spectra was greater than that of the (222). This may be completely explained by assuming that the atoms of the aluminium pair remain in contact and do not share in the expansion of the lattice.—S. **Datta**: The absorption spectrum of potassium vapour. The principal series lines up to $m=42$ have been observed as absorption lines and their wave-lengths accurately measured. The series equation shows satisfactory agreement between the observed and the calculated values, with the exception of deviations for the last few lines, for which a possible explanation has been given. The first seven members of the series have been resolved into their components. Besides the absorption of the lines of the principal series, new lines have been found to be absorbed at higher pressures, which seem to have no correspondence with the known lines in the emission spectrum. The combination lines 1*s*–2*d* and 1*s*–3*d* have been found to be absorbed, the first as a pair, confirming the presence of a satellite to the lines of the diffuse series. Their appearance in the absorption spectrum gives distinct evidence of contradiction of the selection principle.—K. R. **Ramanathan**: The molecular scattering of light in vapours and in liquids and its relation to the opalescence observed in the critical state. Three instances of light scattering by homogeneous media are known—opalescence near critical point, scattering of light by gases, and scattering of light by liquids. Experiments on scattering of light by ether, in vapour and liquid phases, at different temperatures from 33° C. up to critical temperature 193·6° and in gaseous phase from 193·6° to 217°, give results in accord with the Einstein-Smoluchowski formula and not with the Rayleigh law. The Einstein-Smoluchowski formula is inapplicable in *immediate neighbourhood* of critical point. The scattered light is markedly less blue here. Following the theoretical work of Ornstein and Zernike, from maximum value of intensity of scattered light the value of ϵ, radius of action of ether molecule, is deduced to be $4\cdot6\times10^{-7}$ cm. Light scattered at right angles to incident beam is imperfectly polarised; ratio of weak component to strong is throughout nearly 1·2 per cent., in case of vapour, while in case of liquids, ratio is 8 per cent. at ordinary temperatures, remaining constant till about 120° and then falling off to about 1·2 per cent. at critical point. There is no change of imperfection of polarisation on passing through critical point. Correction due to this in the expression for intensity of scattered light is given.

PARIS.

Academy of Sciences, October 16.—M. Albin Haller in the chair.—The president announced the death of F. P. A. Barbier, correspondant for the section of chemistry.—Maurice **Hamy**: The calculation of a double integral which occurs in the theory of the diffraction of solar images by a rectangular slit.—An. **Bilimovitch**: The lines of inertia on a surface.—Ed. **Le Danois**: The hydrology of the North Atlantic. It is considered that the name Gulf Stream should be restricted to the return current from the equatorial region. The variations in temperature and salinity of the surface water are due to a seasonal phenomenon and not to ramifications of the Gulf current.—C. **Raveau**: Demonstration of Fresnel's law of æther drift, without reference to the relativity of time and space.—André **Guilbert**: The calculation of the attraction of electro-magnets.—Maurice **Curie**: The refractive indices of the phosphorescent sulphides. The refractice indices of phosphorescent sulphides of calcium, strontium, barium, and zinc have been measured directly by the observation under the microscope of particles of the sulphides in a transparent homogeneous liquid of the same refractive index. The values found differ considerably from the square root of the dielectric capacity and lend no support to the theory of P. Lénard.—L. J. **Simon** and L. **Zivy**: The neutralisation of tartaric acid by potash in presence of the chlorides of the alkaline earths. In the presence of calcium (or barium) chloride, the titration of tartaric acid requires the same volume of caustic potash solution for neutralisation with either methyl orange or phenolphthallin as indicator.—Albert **Perrier** and B. **de Mandrot**: The elasticity and symmetry of quartz at high temperatures. Flat plates were cut from quartz crystals in four directions: along the binary and ternary axes, then in two directions normal to the binary axis. The quartz plates were worked with optical precision and the flexures caused by a load at the centre determined for temperatures ranging from 18° C. to 1140° C. There is a rapid change in the value of Young's modulus at 576° C., a rise of 1° increasing the modulus to three times its value. Aimé **Azam**: The origin and process of formation of the soils at the Hague.—Jean **Mascart**: The proportion of successes in weather prediction. The question as to what constitutes a successful weather prediction is discussed, and it is pointed out that many predictions are too vaguely drawn and cover too many possibilities. If the forecast is drawn in precise terms, weather prediction may be considered satisfactory if the proportion of successes is more than 60 per cent.—P. **Bugnon**: The systematic position of the Euphorbiaceæ. J. **Beauverie**: The "critical period of wheat."—L. **Blaringhem**: A sterile hybrid of spelt and rye.—Adrien Davy **de Virville** and Fernand **Obaton**: Observations and experiments on ephemeral flowers. Light has no action on the opening or closing of the corolla in ephemeral flowers, and hygrometric state has a very slight influence. The temperature is the main factor in these movements.—Marc **Bridel** and Mlle. Marie **Braecke**: Rhinanthine and aucubine. Rhinanthine is impure aucubine. Rhinanthine was extracted by Ludwig from the seeds of *Rhinanthus Crista-galli*, and aucubine was discovered by Bourquelot and Hérissey in the seeds of *Aucuba japonica*. Rhinanthine is regarded by the authors as a mixture of saccharose and aucubine, and experimental data are given in support of this view.—Fred **Vlès**: The variations of the hydrogen ion concentration in the neighbourhood of eggs undergoing division.—J. **Legendre**: The trophic rôle of birds as regards the culicines. Further studies on the part played by domestic animals and birds in the protection of man against insects (Culex, Stegomyia).—Paul **Wintrebert**: Movement without nerve and nervous movement of the embryos of Raia.—A. **Gruvel**: Two species of lobster from the coasts of Indo-China.—J. **Dumas** and D. **Combiesco**: Dysenteric intoxication of the rabbit and cholera intoxication of the guinea-pig by ingestion of soluble dysenteric and cholera toxins.

Official Publications Received.

Journal of the College of Science, Imperial University of Tokyo. Vol. 42, Art. 3: Ökologische Untersuchungen der Schwimminseln in Japan. Von Harufusa Nakano. Pp. 57. 1.50 yen. Vol. 44, Art. 1: Fossils from the Upper Musashino of Kazusa and Shimosa. By Matajiro Yokoyama. Pp. 200+viii+17 plates. 9.20 yen. Vol. 44, Art. 2: On some Japanese Freshwater Triclads; with a Note on the Parallelism in their Distribution in Europe and Japan. By Tokio Kaburaki. Pp. 71+1 plate. 2.30 yen. (Tokio: Imperial University; Maruzen Co., Ltd.)

Philosophical Transactions of the Royal Society of London. Series B, Vol. 211: The Breeding Places of the Eel. By Dr. Johs. Schmidt. Pp. 179-208. (London: Harrison and Sons, Ltd.)

Actes de la Société Helvétique des Sciences Naturelles. 101e Session annuelle du 29 août au 1er septembre 1920 à Neuchatel. 1re Partie. Pp. 266+55. (Aarau: H. R. Sauerländer et Cie.)

Bulletin of the American Museum of Natural History, Vol. 46, Art. 10: The Locomotor Apparatus of certain Primitive and Mammal-like Reptiles. By Alfred Sherwood Romer. Pp. 517-606+plates 27-46. (New York: American Museum of Natural History.)

Contributions from the Jefferson Physical Laboratory, from the Cruft High-Tension Electrical Laboratory, and from Colleagues and Former Students, dedicated to Professor Edwin Herbert Hall, for the Year 1921. Vol. 15 (unpaged). (Cambridge, Mass.: Harvard University Press.)

The Institution of Civil Engineers. Engineering Abstracts prepared from the Current Periodical Literature of Engineering and Applied Science, published outside the United Kingdom. New Series, No. 13, October. Edited by W. F. Spear. Pp. 176. (London: Institution of Civil Engineers.)

República Argentina. Ministerio de Agricultura de la Nación: Oficina Meteorologica Nacional. La Máxima de la radiación solar en Enero y Febrero de 1920, y el estado del tiempo mundial. Por H. H. Clayton y Guillermo Hoxmark. Pp. 18. (Buenos Aires.)

Rapport annuel sur l'état de l'Observatoire de Paris pour l'année 1921. Par M. B. Baillaud. Pp. 35. (Paris: Impr. Nationale.)

Canada. Department of Mines: Mines Branch. No. 549: Report on Structural Materials along the St. Lawrence River, between Prescott, Ont., and Lachine, Que. By Joseph Keele and L. Heber Cole. Pp. 119+30 plates+3 maps. (Ottawa.)

Nedbøriakttagelser i Norge utgitt av det Norske Meteorologiske Institutt. Årgang 27, 1921. Pp. xiii+79+47+2 maps. (Kristiania: H. Aschehoug and Co.) 6.00 kr.

Jahrbuch des Norwegischen Meteorologischen Instituts für 1921. Pp. xi+174. (Kristiania: Gröndahl and Sön.)

Field Museum of Natural History. Publication 210, Zoological Series, Vol. 12, No. 3: Game Birds from North-western Venezuela. By W. H. Osgood and B. Conover. Pp. 17-48. (Chicago.)

Annual Conference of the Universities of Great Britain and Ireland, 1922. Abridged Report of Proceedings. Pp. 32. (London: Universities Bureau of the British Empire.) 1*s*.

Nedbøriagttagelser i Norge utgit av det Norske Meteorologiske Institut. Middelværdier, Maksima og Minima. Pp. xvi+xi+83+12 plates+2 maps. (Kristiania: H. Aschehoug and Co.) 6.00 kr.

State of Illinois. Department of Registration and Education: Division of the Natural History Survey. Bulletin, Vol. 13, Art. 14: Forest Insects in Illinois. I.: The Subfamily Ochthiphilinæ (Diptera, Family Agromyzidæ). By J. R. Malloch. Pp. 345-362. Bulletin, Vol. 13, Art. 15: The Small Bottom and Shore Fauna of the Middle and Lower Illinois River and its Connecting Lakes, Chillicothe to Grafton; its Valuation; its Sources of Food Supply; and its Relation to the Fishery. By R. E. Richardson. Pp. 363-522. Bulletin, Vol. 13, Art. 16: An Ecological Survey of the Prairie Vegetation of Illinois. By H. C. Sampson. Pp. 523-578+plates 48-77. Bulletin, Vol. 14, Art. 1: The Orchard Birds of an Illinois Summer. By S. A. Forbes and A. O. Gross. Pp. 8+6 plates. Bulletin, Vol. 14, Art. 2: Distribution of the Fresh-water Sponges of North America. By F. Smith. Pp. 9-22. (Urbana, Ill.)

República Argentina. Ministerio de Agricultura de la Nación: Oficina Meteorologica Nacional. Las Condiciones físicas del Atlántico Sur entre et Río de La Plata y las Islas Orcadas del Sur durante el verano. Por R. C. Mossman. Pp. 26. (Buenos Aires.)

University of London: University College. Calendar, Session 1922-1923. Pp. lxviii+410+lxix-clxxxviii. (London: Taylor and Francis.)

Annuaire de l'Académie Royale des Sciences, des Lettres et des Beaux-Arts de Belgique. 1922, 88e année. Pp. 124+209+plates. (Bruxelles: M. Lamertin; M. Hayez.)

Ministry of Agriculture, Egypt. Cotton Research Board. Second Annual Report, 1921. Pp. xvi+203. (Cairo: Government Publications Office.) 15 P.T.

Bulletin of the American Museum of Natural History. Vol. 45, III.: The Predaceous Enemies of Ants. By J. Bequaert. Pp. 271-331. Vol. 45, IV.: Ants in their Diverse Relations to the Plant World. By J. Bequaert. Pp. 333-583. Vol. 45, V.: The Anatomy of certain Plants from the Belgian Congo, with Special Reference to Myrmecophytism. By I. W. Bailey. Pp. 585-621. Vol. 45, VI.: Notes on a Collection of West African Myrmecophiles. By W. M. Mann. Pp. 623-630. Vol. 45, VII.: Keys to the Genera and Subgenera of Ants. By W. M. Wheeler. Pp. 631-710. Vol. 45, VIII.: A Synonymic List of the Ants of the Ethiopian Region. By W. M. Wheeler. IX.: A Synonymic List of the Ants of the Malagasy Region. By W. M. Wheeler. Pp. 711-1055. (New York.)

Jamaica. Annual Report of the Department of Agriculture for the Year ended 31st December 1921. Pp. 43. (Kingston, Jamaica.)

Studies on the Cyclostomatous Bryozoa. By F. Canu and R. S. Bassler. (No. 2443: From the Proceedings of the United States National Museum, Vol. 61, Art. 22.) Pp. 160+28 plates. (Washington: Government Printing Office.)

Diary of Societies.

MONDAY, NOVEMBER 13.

ROYAL SOCIETY OF ARTS, at 8.—J. Slater: The Strand and the Adelphi in Ancient Times.
ENTOMOLOGICAL SOCIETY OF LONDON, at 8.
SURVEYORS' INSTITUTION, at 8.—J. M. Clark: Presidential Opening Address.
ROYAL GEOGRAPHICAL SOCIETY (at Æolian Hall), at 8.30.—Commander F. Wild: The Work of "The Quest."

TUESDAY, NOVEMBER 14.

ROYAL HORTICULTURAL SOCIETY, at 3.—Dr. H. Wager: The Colours of Flowers and Fruits (Masters Memorial Lecture).
INSTITUTION OF PETROLEUM TECHNOLOGISTS (at Royal Society of Arts), at 5.
INSTITUTE OF MARINE ENGINEERS, INC., at 6.30.—J. Steinheil: The Evolution of the Nobel Diesel Engine (Part I.).
QUEKETT MICROSCOPICAL CLUB, at 7.30.—Dr. R. J. Ludford: The Cytology of Growth.
ILLUMINATING ENGINEERING SOCIETY (at Royal Society of Arts), at 8.—Reports on Progress during the Vacation and Developments in Lamps and Lighting Appliances.
ROYAL PHOTOGRAPHIC SOCIETY OF GREAT BRITAIN, at 7.—J. C. Kingdon: Experiments on the Tensile Strength of Gelatine and Gelatine-jelly; Discussion of the Results as bearing on the Structure of Gelatine; with a Note on the Evolution of Heat by Gelatine when expanding in Water.—K. C. D. Hickman: Rapid Sulphiding of Bromide Prints. Toning with Gases instead of Liquids; together with a Demonstration of the Methods employed.—D. Northall-Laurie: Photomicrographs in Colour mounted to exhibit changing Tints.

WEDNESDAY, NOVEMBER 15.

ROYAL MICROSCOPICAL SOCIETY, at 8.—C. Beck: Glare and Flooding in Microscope Illumination.—Dr. C. Singer: The First Mechanical Microtome.—Prof. G. S. Thapar: The Occurrence and Significance of a Third Contractile Vacuole in *Paramecium caudatum*.—Prof. B. L. Bhatia: The Significance of Extra Contractile Vacuoles in *Paramecium caudatum*.
ROYAL SOCIETY OF ARTS, at 8.—Dr. S. Smith: The Action of the Beater in Paper Making, with Special Reference to the Theory of the Fibre Board and its Application to Old and New Problems of Beater Design.

THURSDAY, NOVEMBER 16.

ROYAL SOCIETY, at 4.30.—*Probable Papers*.—Prof. A. S. Eddington, The Propagation of Gravitational Waves.—Dr. J. H. Jeans: The Theory of the Scattering of α and β Rays.—Prof. A. P. Chattock and L. F. Bates: The Richardson Gyro-magnetic Effect.—P. M. S. Blackett: The Analysis of α Ray Photographs.—J. H. Jones: The Kinetic Energy of Electrons emitted from a hot Tungsten Filament.—Dr. W. Wilson: The Quantum Theory and Electromagnetic Phenomena.—S. Marsh and A. E. Evans: Measurements of Electrode Potential Drop with Direct Current and Alternating Current Electrolysis.
LINNEAN SOCIETY, at 5.
ROYAL AERONAUTICAL SOCIETY (at Royal Society of Arts), at 5.30.—R. McKinnon Wood: The Co-relation of Model and Full-Scale Work.
CHILD-STUDY SOCIETY (at Royal Sanitary Institute), at 6.—A. D'Arcy Chapman: The Measurement of the Intelligence of School Children in Massachusetts, U.S.A.
INSTITUTION OF ELECTRICAL ENGINEERS, at 6.—The late Dr. G. Kapp: The Improvement of Power Factor (read by Prof. M. Walker).
CHEMICAL SOCIETY, at 8 (and Informal Meeting).
CAMERA CLUB, at 8.15.—T. H. B. Scott: Lourdes.

FRIDAY, NOVEMBER 17.

ROYAL SOCIETY OF ARTS (Indian Section), at 4.30.—J. W. Meares: The Development of Water Power in India.
INSTITUTION OF MECHANICAL ENGINEERS, at 6.—Adjourned discussion on paper by Sir Vincent L. Raven: Electric Locomotives.
JUNIOR INSTITUTION OF ENGINEERS, at 7.30.—Annual General Meeting.
ROYAL PHOTOGRAPHIC SOCIETY OF GREAT BRITAIN, at 8.—N. E. Luboshez: Definition and Diffusion of Image.

PUBLIC LECTURES.

SATURDAY, NOVEMBER 11.

HORNIMAN MUSEUM (Forest Hill), at 3.30.—Dr. W. A. Cunnington: The Natural History of Crabs.

MONDAY, NOVEMBER 13.

CITY OF LONDON Y.M.C.A. (186 Aldersgate Street), at 6.—Sir Bruce Bruce-Porter: How to Keep Well.

TUESDAY, NOVEMBER 14.

SCHOOL OF ORIENTAL STUDIES, at 5.—Dr. T. G. Bailey: The Sansis, or Thieves of India: Their Language, History, and Customs.
ROYAL SANITARY INSTITUTE, at 5.15.—Miss A. D. Muncaster: Some Hygienic Aspects of Food and Food Preparation. (1) The Hygiene of Raw Food (Chadwick Lecture).
GRESHAM COLLEGE, at 6.—W. H. Wagstaff: Geometry. Succeeding Lectures on November 15, 16, and 17.

THURSDAY, NOVEMBER 16.

UNIVERSITY COLLEGE, at 2.30.—Miss Margaret A. Murray: Recent Excavations in Malta.
KING'S COLLEGE, at 5.30.—M. Beza: The Story of Cupid and Psyche in Rumanian Folklore.

FRIDAY, NOVEMBER 17.

BEDFORD COLLEGE FOR WOMEN, at 5.30.—Miss K. M. Westaway: Plutarch: His Life and Writings.

SATURDAY, NOVEMBER 18.

HORNIMAN MUSEUM (Forest Hill), at 3.30.—A. D. Howell Smith: Textiles and their History.